

Varietal Trials OF FARM CROPS

1988 EDITION

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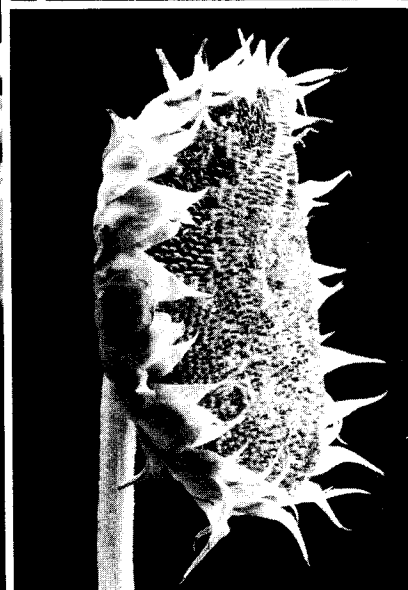
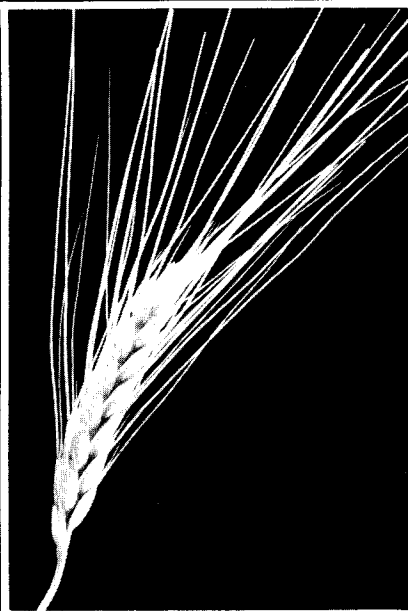
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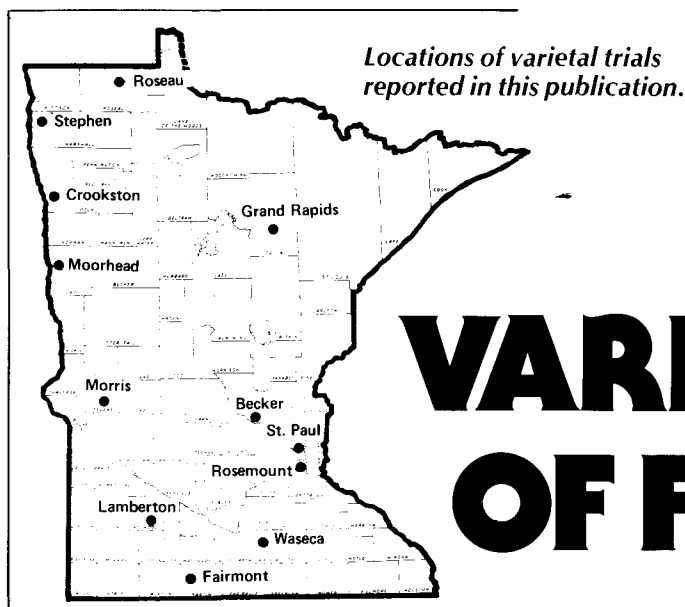
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VARIETAL TRIALS OF FARM CROPS

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, Lamberton, 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.

VARIETY CLASSIFICATIONS

Varieties of many of the crops are classed into three groups "recommended varieties," "varieties not adequately tested," and "other varieties." Some crops have further groupings within these categories. Varietal descriptions are arranged in alphabetical order within groups.

The classifications of varieties as "recommended" and "other" are determined each year by the Minnesota Agricultural Experiment Station Crop Variety Review Committee. A variety is usually not eligible for the "recommended" group unless it has been better than other varieties in important characteristics in three 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." Available information is presented for these varieties, but no conclusions are drawn regarding their suitability for Minnesota conditions.

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

Seed of varieties in 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 1988 Planting. This annual publication can be obtained without charge from the Minnesota Crop Improvement Association, 1900 Hendon Avenue, St. Paul, MN 55108, or from county extension agents' offices.

INTERPRETING THE TABLES

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 indicates that in only 1 time out of 20 will the yield differences reported be achieved by chance, the remaining times the reported differences should be real.

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 indi-

cated in the tables as date mature, heading, or blooming; days to mature, heading, or blooming; or moisture percentage at harvest.

AUTHORS AND RESEARCHERS

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

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, Lamberton, Morris, Crookston-Stephen, and Grand Rapids was supervised by W.E. Lueschen, J.H. Ford, D.D. Warnes, J.V. Wiersma, and D.L. Rabas, respectively.

Publication Chair	Leland L. Hardman
Editor	Larry A. Etkin
Photo Editor	David L. Hansen



Birdsfoot Trefoil

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 1988, 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 amount of fall growth, which in Minnesota is an indication of rate of growth after cutting and degree of winterhardiness.

Very winterhardy varieties produce very little fall growth and 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 consistent production can be expected from most winterhardy varieties.

Moderately winterhardy varieties produce good fall growth, are characterized by rapid recovery after harvest, and usually reach 1/10 bloom several days earlier than more winterhardy varieties. High levels of root disease resistance are needed for moderately winterhardy varieties to stay productive for more than two years under a four-harvest management. The general pattern of production for moderately winterhardy varieties having the greatest fall growth has been to produce high yields during the first year after seeding, good yields—similar to winterhardy varieties—for year 2, and reduced yields in years 3 and 4. Third and fourth year yields presented in Table 1 can help identify varieties that maintain high yields beyond year 2.

Nonwinterhardy varieties are characterized by extremely tall fall growth that continues until fall freeze-up. They produce similar yields as the moderately winterhardy varieties during the summer, but will produce more forage growth during the fall growth period. They will not survive most winters. Nonwinterhardy varieties should only be grown for plow down in the seeding year.

The Minnesota Agricultural Experiment Station and USDA released the non-dormant nonwinterhardy variety, Nitro, in 1986. Nitro is a special-purpose alfalfa designed as a one-year hay source and a fall plow down crop. It was selected for increased concentration of nitrogen in the roots and for larger roots in which to store nitrogen. Nitro is the first alfalfa variety with specialized nitrogen accumulation attributes.

Other nonwinterhardy varieties are not listed in the tables but include Amador, Ardiente, AS-13R, AS-49R, Caliente, Caliverde 65, CUF 101, Florida 77, Granada, Hayden, Joaquin II, Lew, Maxidor, Mesa Sirsa, Mesilla, Moapa 69, Pierce, Sonora



Semidwarf or short statured oat varieties are being developed for growers to use as a companion crop in establishing alfalfa.

70, 183, WL 504, WL 508, WL 514, WL 515, WL 600, UC Cibola, UC Salton, Validor, 572, and 581.

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. They generally show losses in stand by the end of the second year after seeding. In some cases where infection is severe, stand losses are often observed by the end of the first year after seeding. Stand reductions after winter are often due to a

combination of wilt damage and winter injury.

Phytophthora Root Rot—This fungal disease is a major concern 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. It contributes to stand decline mainly in combination with other disease organisms. Therefore, resistance to Fusarium wilt itself, or resistance to both 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 kills susceptible plants. The disease is favored by hot, moist conditions, and will therefore be most frequently observed in southeast 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. Its spread in the state has been slow. Planting resistant varieties will help provide insurance for long-lived stands. Varieties having at least a low level of resistance are indicated in Table 2.

Table 1. Average yields of alfalfa varieties expressed as percentage of Vernal for all tests with one or more harvest years in Minnesota, 1959-87

Variety	Test Location ¹						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
VERY WINTERHARDY													
Rambler	♦		♦	♦			4	85	86	83	85	86	84
Prowler	♦	♦	♦	♦	♦	♦	6	97	95	96	97	96	97
Ladak	♦						3	87	88	78	89	88	82
Spredor 2	♦	♦		♦	♦	♦	5	96	93	93	82	94	90
Teton	♦		♦	♦			7	89	93	86	93	91	90
Travois	♦	♦	♦	♦			5	88	88	88	87	88	88
Maverick	♦	♦	♦	♦	*	♦	7	97	101	93	95	99	93
WINTERHARDY													
Wrangler	*	♦	♦	♦	♦	♦	7	100	105	107	113	102	110
Victoria	♦						2	99	100	100	97	99	98
Vernal, tons/acre, 15% M	♦	♦	♦	*	♦	♦	46	5.5	5.2	4.5	3.7	5.4	4.1
Baker	*	♦	*	*	♦	♦	15	97	99	101	106	98	102
526	*	*	*	*	*	*	7	107	109	109	116	108	112
636	*	♦	♦	♦			5	108	111	115	—	108	115
Vancor	♦	*	*	♦	♦	♦	6	103	99	100	98	101	100
G2818	♦	♦	♦	♦	*	♦	7	102	106	97	95	104	97
Agate	♦	♦	♦	♦	♦	♦	29	98	99	101	98	99	100
Iroquois	♦	♦	♦	♦	♦	*	15	106	104	104	109	105	106
Blazer	*	*	♦	♦	*	♦	10	103	106	111	109	104	110
629	*	♦	♦	♦	*		6	104	107	108	—	105	108
Thunder	*	♦	♦	♦	♦	♦	7	103	100	100	102	101	101
WL 225	♦						1	113	—	—	—	113	—
Phytor	♦	*	♦	♦	*	♦	8	102	104	108	107	103	108
Surpass	*	♦	♦	♦			4	109	113	114	—	110	114
120	*	*	♦	*	*	*	11	107	110	114	113	108	114
A-54	♦	♦	*	*			6	102	106	108	101	104	106
Ranger	♦	♦	♦	♦	♦	♦	26	97	98	97	99	97	97
532	♦	*	*	♦	♦	*	8	106	105	105	107	106	105
Dart	*	♦	♦	♦			5	109	111	117	—	109	117
Milkmaker	*	♦	♦	♦	♦		7	103	105	103	94	104	99
Polar II	♦	♦	♦	♦	♦	♦	7	99	98	98	90	99	96
WL 315	♦	*	*	♦	♦	♦	5	98	105	103	101	102	102
MODERATELY WINTERHARDY													
Arrow	*	♦	♦	♦			5	106	111	114	—	108	114
Big Ten	♦	♦	♦	♦	♦	♦	6	105	105	101	—	105	101
Marathon	♦	♦	♦	♦			6	103	105	102	93	104	99

Table 1 (continued). Average yields of alfalfa varieties expressed as percentage of Vernal for all tests with one or more harvest years in Minnesota, 1959-87

Variety	Test Location ¹						Number tests	Yield (percent of Vernal)				Average over years	
	R	W	L	M	C	G		Year after seeding				1-2	3-4
								1st	2nd	3rd	4th		
MODERATELY WINTERHARDY													
Sparta	*	◆	◆	◆	◆	◆	6	107	108	108	—	107	108
Apollo	◆	◆	◆	◆	*	◆	11	101	100	104	103	100	103
Impact	◆	◆	◆	◆	◆	◆	4	107	—	—	—	107	—
Oneida	*	*	◆	◆	*	*	9	103	103	105	109	103	106
Centurion	◆	◆	◆	◆	◆	◆	4	110	—	—	—	110	—
Bell Ringer	*	◆	◆	◆	◆	◆	5	105	105	95	—	105	95
Salute	◆	◆	◆	◆	*	◆	5	105	109	113	—	106	113
Oneida VR	◆	◆	◆	◆	◆	◆	1	105	106	107	—	106	107
Ultra	◆	◆	◆	◆	◆	◆	0	—	—	—	—	—	—
Vernema	◆	◆	*	◆	◆	*	6	107	105	101	96	106	100
Elevation	*	◆	◆	◆	◆	◆	6	108	108	111	—	108	111
Expo	◆	◆	◆	*	*	◆	6	98	103	100	105	101	102
G7730	◆	◆	◆	◆	*	◆	8	102	103	107	105	103	108
Magnum	*	◆	*	◆	◆	◆	8	103	103	105	110	103	107
Perry	◆	◆	*	◆	◆	◆	5	101	105	108	110	103	109
624	◆	◆	◆	◆	*	◆	6	110	109	111	—	110	111
Chief	◆	◆	◆	◆	◆	◆	0	—	—	—	—	—	—
Commandor	◆	◆	◆	◆	◆	◆	5	106	109	110	—	107	110
Dynasty	◆	◆	◆	◆	◆	◆	4	104	107	—	—	105	—
Edge	◆	◆	◆	◆	◆	◆	4	107	104	—	—	106	—
Endure	*	◆	◆	◆	◆	◆	7	103	109	98	109	106	100
Apollo II	◆	◆	◆	◆	◆	◆	8	103	103	94	95	103	94
Duke	◆	◆	◆	*	◆	◆	7	101	104	100	101	103	100
DK 125	◆	◆	◆	◆	◆	◆	4	112	—	—	—	112	—
DK 135	◆	◆	*	◆	◆	◆	6	99	104	97	104	101	99
Peak	*	*	◆	*	◆	◆	10	105	107	112	110	106	111
Preserve	◆	◆	◆	◆	*	◆	8	105	104	93	93	104	93
Saranac	◆	◆	◆	◆	◆	◆	39	104	103	101	102	103	102
Thor	◆	◆	◆	◆	◆	◆	11	107	104	103	102	106	103
Trident	◆	◆	◆	◆	◆	◆	8	101	103	104	107	102	105
630	*	◆	◆	◆	◆	◆	6	107	113	114	—	108	114
5432	◆	◆	◆	◆	◆	◆	5	104	112	—	—	105	—
Drummor	◆	◆	◆	◆	*	◆	8	101	101	90	90	101	90
G-2815	◆	◆	◆	◆	◆	◆	7	100	99	98	101	100	99
Target	◆	◆	◆	◆	◆	◆	5	105	107	111	—	105	111
Trumpetor	◆	*	*	◆	*	*	8	103	105	98	97	104	98
Aquarius	◆	◆	◆	◆	◆	◆	5	97	101	95	91	99	93
Decathlon	◆	◆	◆	◆	◆	◆	6	99	100	88	99	100	90
Sure	◆	◆	◆	◆	◆	◆	4	107	—	—	—	107	—
Armor	◆	*	◆	◆	*	*	8	103	106	105	102	105	104
Crown	◆	◆	◆	◆	◆	◆	4	110	—	—	—	110	—
WL 320	*	*	◆	◆	◆	*	6	106	110	109	—	108	108
Tomahawk	◆	◆	◆	◆	◆	◆	4	113	—	—	—	113	—
Eagle	◆	◆	◆	◆	◆	◆	7	105	106	80	—	106	80
Magnum Plus	*	◆	◆	◆	◆	◆	2	108	107	118	—	108	118
Magnum III	◆	◆	◆	◆	◆	◆	4	107	110	—	—	108	—
Epic	*	◆	*	*	◆	◆	10	102	106	105	111	104	107
Excalibur	◆	◆	◆	◆	◆	◆	6	104	99	85	—	102	85
G-2852	*	◆	◆	◆	◆	◆	5	108	104	100	—	107	100
Cimarron	◆	◆	◆	◆	◆	◆	6	105	98	89	94	102	90
Shenandoah	◆	◆	◆	◆	*	*	6	105	106	89	91	106	90
Challenger	◆	◆	◆	◆	◆	◆	7	102	101	86	100	102	89

¹Test 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 after at least 2 harvest years for one or more tests.

Table 2. Winterhardness as predicted by fall growth score and disease resistance of alfalfa varieties eligible for certification

Variety	Developer or Marketer ¹	Fall growth (score) ²	RESISTANT PLANTS ³			Anthracnose (rating) ⁴	Verticillium wilt (rating) ⁴
			Bacterial wilt (percent)	Phytophthora root rot (percent)	Fusarium wilt (percent)		
----- highest value best -----							
VERY WINTERHARDY							
Rambler	Agr. Canada ^{SV}	8.0	16	3	25	S	—
Prowler	Pride Seed Co. ^W	7.9	72	2	18	S	—
Ladak	USDA (foreign introduction) ^N	7.5	8	2	29	S	—
Spredor 2	Northrup King Co. ^W	7.5	58	5	24	S	—
Teton	S. Dakota Agr. Exp. Sta. ^{IV}	7.4	15	7	26	S	—
Travois	S. Dakota Agr. Exp. Sta. ^{EINSVYf}	7.4	37	1	15	S	—
Maverick	AgriPro ^g	7.3	42	17	36	S	—
WINTERHARDY							
Wrangler	USDA & Nebraska Agr. Exp. Sta. ^{SUVYbi}	7.0	36	47	42	LR	LR
Victoria	Arkansas Agr. Exp. Sta. ^Z	6.9	5	12	48	S	—
Vernal	Wisconsin Agr. Exp. Sta. & USDA ^{EINSUVYbfi}	6.5	42	5	32	S	—
Baker	USDA & Nebraska Agr. Exp. Sta. ^{IVf}	6.5	49	2	36	LR	—
526	Pioneer Hi-Bred International Inc. ^a	6.5	57	8	15	LR	—
636	Garst Seed Co. ^K	6.3	54	54	47	MR	R
Vancor	Northrup King Co. ^W	6.2	56	22	38	R	—
G2818	Funk Seeds Intl. ^J	6.1	58	24	44	LR	—
Agate	USDA & Minnesota Agr. Exp. Sta. ^{ISUVYbfi}	6.0	65	43	54	MR	—
Iroquois	Cornell University ^{VYb}	6.0	61	1	22	S	—
Blazer	Land O'Lakes ^E	5.9	49	24	26	LR	LR
629	Garst Seed Co. ^K	5.8	51	31	62	MR	MR
Thunder	AgriPro ^{Ug}	5.7	43	49	55	MR	—
WL 225	W-L Research, Inc. ^N	5.7	61	43	73	MR	R
Phytor	Northrup King Co. ^W	5.5	34	30	39	S	—
Surpass	Cenex/Land O'Lakes ^E	5.5	49	45	46	MR	R
120	DeKalb-Pfizer Genetics ^H	5.5	57	39	20	LR	—
A-54	Ramy Seed Co. ^d	5.4	26	11	25	—	—
Ranger	USDA & Nebraska Agr. Exp. Sta. ^{EINSVf}	5.4	18	4	25	S	—
532	Pioneer Hi-Bred International, Inc. ^a	5.4	63	7	37	MR	—
Dart	AgriPro ^A	5.3	63	62	46	R	R
Milkmaker	Lovelock Seed Co., Inc. ^O	5.3	43	38	56	MR	—
Polar II	Pride Seed Co. ^W	5.3	57	60	34	S	—
WL 315	W-L Research, Inc. ^N	5.3	66	29	76	MR	MR
MODERATELY WINTERHARDY							
Arrow	AgriPro ^{Ugi}	5.2	57	58	61	MR	R
Big Ten	Premium Seed Co. ^{Fb}	5.2	53	30	48	MR	—
Marathon	Cargill, Inc. ^D	5.2	36	2	13	S	—
Sparta	Cenex Land O'Lakes ^E	5.2	48	20	22	S	—
Apollo	AgriPro ^{Ugi}	5.1	36	36	40	LR	—
Impact	Peterson Seed Co., Inc. ^Z	5.1	65	57	46	MR	R
Oneida	Cornell University ^{Ybi}	5.1	62	52	62	S	—
Centurian	Blue Chip Quality Seed ^c	5.0	57	51	45	R	R
Bell Ringer	Lovelock Seed Co., Inc. ^L	4.9	41	8	27	LR	MR
Salute	United AgriSeeds, Inc. ^{Rh}	4.9	54	34	44	MR	—
Oneida VR	Cornell University ^d	4.8	44	16	55	MR	HR
Ultra	SeedTec Int'l ^{l^e}	4.8	67	27	58	HR	R
Vernema	USDA & Washington Agr. Exp. Sta. ^{VY}	4.8	21	13	38	S	MR
Elevation	Jacques Seed Co. ^O	4.7	53	42	40	R	MR
Expo	Paymaster Seeds ^D	4.7	37	47	42	MR	—
G7730	Funk Seed Intl. ^{JY}	4.7	55	62	62	LR	—
Magnum	Dairyland Seed Co. Inc. ^G	4.7	51	5	32	MR	—
Perry	USDA & Nebraska Agr. Exp. Sta. ^{SY}	4.7	30	10	38	S	—

Table 2 (continued). Winterhardness as predicted by fall growth score and disease resistance of alfalfa varieties eligible for certification

Variety	Developer or Marketer ¹	RESISTANT PLANTS ³				Anthracnose (rating) ⁴	Verticillium wilt (rating) ⁴
		Fall growth (score) ²	Bacterial wilt (percent)	Phytophthora root rot (percent)	Fusarium wilt (percent)		
----- highest value best -----							
MODERATELY WINTERHARDY							
624	Garst Seed Co. ^K	4.7	45	19	37	MR	—
Chief	Jacques Seed Co. ^O	4.6	80	66	48	R	R
Commandor	Northrup King Co. ^W	4.6	51	45	34	HR	MR
Dynasty	Dairyland Seed Co., Inc. ^B	4.6	60	46	46	MR	R
Edge	Payco Seeds ^X	4.6	44	37	47	HR	R
Endure	PAG Seeds ^D	4.6	45	28	41	MR	R
Apollo II	AgriPro ^{Ugi}	4.5	43	54	47	MR	MR
Duke	AgriPro ^A	4.5	43	55	43	MR	—
DK 125	DeKalb-Pfizer Genetics ^H	4.5	60	39	45	HR	R
DK 135	DeKalb-Pfizer Genetics ^H	4.5	26	20	46	MR	MR
Peak	Premium Seed Co., ^b	4.5	52	16	28	LR	LR
Preserve	Northrup King Co.	4.5	40	19	35	LR	—
Saranac	Cornell University ^b	4.5	49	3	34	S	—
Thor	Northrup King Co. ^W	4.5	69	1	30	S	—
Trident	PAG Seeds ^D	4.5	37	71	55	MR	—
630	Garst Seed Co. ^K	4.5	59	45	36	MR	MR
5432	Pioneer Hi-Bred International, Inc. ^a	4.5	61	23	68	—	R
Drummor	Northrup King Co. ^W	4.4	38	29	17	MR	—
G 2815	Funk Seed Intl. ^J	4.4	51	16	56	MR	—
Target	Ziller Seed Farm, Inc. ^J	4.4	66	30	43	MR	—
Trumpetor	Northrup King Co. ^W	4.4	28	8	51	R	MR
Aquarius	Lincoln Seed & Feed Co. ^S	4.3	75	2	47	HR	—
Decathlon	Cargill, Inc. ^D	4.3	66	21	43	MR	MR
Sure	Cenex/Land O'Lakes ^E	4.3	72	50	52	HR	R
Armor	AgriPro ^{Ugi}	4.2	39	43	44	MR	—
Crown	Paymaster Seeds ^D	4.2	47	47	49	HR	R
WL 320	W-L Research, Inc. ^N	4.2	58	37	60	MR	MR
Tomahawk	Jung Farms Inc. ^P	4.1	46	37	40	HR	MR
Eagle	Asgrow Seed Co. ^B	4.0	58	36	37	R	MR
Magnum +	Dairyland Seed Co., Inc. ^G	4.0	39	28	41	MR	LR
Magnum III	Dairyland Seed Co., Inc. ^G	4.0	54	22	44	MR	MR
Epic	Larry Peterson, Ltd. ^{Rc}	3.9	58	34	45	S	—
Excaliber	Blue Chip Quality Seed ^C	3.9	43	8	50	MR	R
G 2852	Funk Seeds Intl. ^{JY}	3.8	56	38	43	HR	R
Cimarron	Great Plains Research ^M	3.6	44	15	52	HR	LR
Shenandoah	Great Plains Research ^M	3.6	56	12	36	HR	—
Challenger	Cargill, Inc. ^D	3.5	46	46	22	R	—
NON-WINTERHARDY							
Nitro	USDA & Minnesota Agr. Exp. Sta. ^{Uzb}	2.4	1	32	67	S	S

¹1988 seed sources are listed at the end of the forage crops section. ²Based on fall growth in mid-October after cutting 1st week of September: 1 = tallest (least winterhardy), 9 = shortest. ³Plants with little or no injury are classified as resistant. ⁴Resistance 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 can also 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 Empire) and 1988 sources of seed¹ are: Leo-112^{UVYI}, Carroll-109^b, Dawn-108, Norcen-105^{ENUYbi}, and Empire-100^{EINSUYbi}. No data is available on Fer-

gus^{Ugi}. Norcen was released in 1983 by the agricultural experiment stations of Minnesota and six other states. It has performed exceptionally well in grazing trials.

¹1988 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 are generally less susceptible to leaf diseases and earlier in maturity than northern types. Varieties presently being sold in Min-

nesota 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 1988 sources of seed¹ are: Barton-105, Rebound-102^{IS}, and Lincoln-95^{INSUVYbfij}

¹1988 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 1988 sources of seed¹ are:

Dart-102^E, Hallmark-100, Sterling-100^{SY}, Napier-100^D, Comet-98^W, and Potomac-87^{INSUVYbfij}. No data is available on Able^f and Crown^{Ugi}.

¹1988 seed sources are listed at the end of the forage crops section.

RED CLOVER

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

years with good winter snow cover.

Varieties were evaluated at Rosemount, Grand Rapids, Lamberton, Morris, and Waseca, Minnesota, for about 13 years. Average hay yield for the variety Lakeland was 3.6, 3.5, and 2.2 tons/acre for the first, second, and third years after seeding, respectively. The relative 2-year yield of varieties

sold in Minnesota (percent of Lakeland) and 1988 sources of seed¹ are: Arlington-113^{ENSUVYbfij}, and Lakeland-100^{NV}. No data is available on: Atlas^W, Alta Swede^{NS}, and Redland 11^{Ugi}.

¹1988 seed sources are listed at the end of the forage crops section.

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 reed canarygrass 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. Satisfactory pasture utilization occurs if the grass is grazed when it is between 6 and 24 inches tall.

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 both gained more weight, and sheep experienced less diarrhea on the low alkaloid varieties than on the common reed canarygrass varieties.

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 are available for low alkaloid vari-

eties PalatonE and Venture^{UYZb}.

¹1988 seed sources are listed at the end of the forage crops section.



Varietal trials are done at test sites across Minnesota, including the University of Minnesota's St. Paul campus, where much of the early selection and evaluation is done.

TALL FESCUE

Tall fescue 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 produc-

tive 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 Ken-

tucky-31) and 1988 sources of seed¹ are: Kentucky-31^{EINSUV^{bi}}, Forager-92^E, and Fawn-78^N. No data is available for Falcon^f.

¹1988 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.

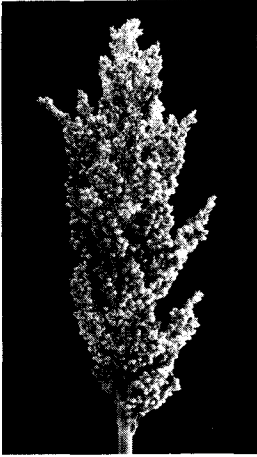
Varieties were evaluated in pure stands for about 13 years in Minnesota. Average annual hay yields were about 3.6 tons/acre

for the variety Itasca. The relative yield of varieties sold in Minnesota (percent of Itasca) and 1988 sources of seed¹ are: Timfor-100^W and Climax-95^{LNOSUV^{bi}}. No data is available for Mor-tim^D and Top-tim^F.

¹1988 seed sources are listed at the end of the forage crops section.

1988 FORAGE SEED SOURCES

- A. Agripro, 824 2nd St. South, P.O. Box 250, Brookings, SD 57006;
- B. Asgrow Seed Co., 7000 Portage Rd., Kalamazoo, MI 49001;
- C. Blue Chip Quality Seed, Abbottsford, WI 54405;
- D. Cargill Seed Div., P.O. Box 5645, Mpls., MN 55440;
- E. Cenex/Land O' Lakes, Station 680, P.O. Box 64089, St. Paul, MN 55164-0089;
- F. Dahlgren & Co., 1220 Sunflower Street, Crookston, MN 56716;
- G. Dairyland Seed Co., Inc., P.O. Box 958, West Bend, WI 53095;
- H. DeKalb-Pfizer Genetics, 3100 Sycamore Rd., DeKalb, IL 60115;
- I. Discount Farm Center, Inc., P.O. Box 84, Watertown, SD 57201;
- J. Funk Seeds, Int'l, 1300 W. Washington St., Bloomington, IL 61701;
- K. Garst Seed Co., P.O. Box 300, Coon Rapids, IA 50058;
- L. George's Seed Outlet, P.O. Box 155, Prescott, WI 54021;
- M. Great Plains Research, Inc., P.O. Box 1745, Stillwater, OK 74074;
- N. Interstate Seed Co., 1214 Prairie Parkway, West Fargo, ND 58078;
- O. Jacques Seed Co., 720 St. Croix, Prescott, WI 54021;
- P. Jung Farms Inc., Randolph, WI 53956;
- Q. Kaltenberg Seed Farms, P.O. Box 278, Waunakee, WI 53597;
- R. Keltgen Seed Co., Box A. Olivia, MN 56277;
- S. Lincoln Seed, 211 Pearl St., Sioux City, IA 51101;
- T. L. Herried Seed, Inc., P.O. Box 367, River Falls, WI 54022;
- U. L.L. Olds Seed Co., Box 7790, 2901 Packers Ave., Madison, WI 53707;
- V. Mohn Seed Co., Rt. 1 Box 152, Cottonwood, MN 56229;
- W. Northrup King Co., 7500 Olson Memorial Hwy., Golden Valley, MN 55427;
- X. Payco Seeds, P.O. Box 70, Dassel, MN 55325;
- Y. Peterson-Biddick Co., Box 190, 102 Alrich S.E., Wadena, MN 56482;
- Z. Peterson Seed Co., P.O. Box 346, Savage, MN 55378;
- a. Pioneer Hi-Bred Int'l, Inc., P.O. Box 287, 7305 N.W. 62nd Ave., Johnston, IA 50131;
- b. Premium Seed Co., 7800 E. State Hwy 101, Shakopee, MN 55379;
- c. Profiseed, Inc., Rt. 2, Hampton, IA 50441;
- d. Ramy Seed Company & Ramy Int'l. Ltd., 4229 N. Front St., Mankato, MN 56001;
- e. SeedTec Int'l, P.O. Box 4692, Fargo, ND 58105;
- f. The Sexauer Co., P.O. Box 58, Brookings, SD 57006;
- g. Sigco Research, P.O. Box 289, Breckenridge, MN 56520;
- h. United Agriseeds, Inc., P.O. Box 4011, Champaign, IL 61820;
- i. Werner Farm Seeds, 3104 Millersburg Blvd., Dundas, MN 55019;
- j. Ziller Seed Farms, Inc., R.R.1 Box 122, Bird Island, MN 55310.



Grain Sorghum

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 ¹ 1982-84	Average 22 trials
Alden	1516	1162	1081	910	1218
Elias	1810	1554	1224	918	1459
Keet	1660	1318	1142	925	1325
Checks ²	1454	1026	919	736	1093
LSD 5%	128	127	99	80	25

¹Irrigated. ²1984-85 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) ¹	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 ²	64	107	3.9	34	56,000	49

¹1 = erect, 9 = flat. ²1984-85 data of progeny of seedlots and varieties imported 10 to 30 years ago.

BARLEY

RECOMMENDED VARIETIES

Morex—Medium yield. Early. Medium lodging resistance. Kernel plumpness intermediate. Six-rowed, 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. Susceptible to loose smut. Developed by Minnesota Agricultural Experiment Station from

cross of Cree and Bonanza. Released in 1978.

Robust—High yield. Medium maturity. Superior to Morex in lodging resistance and kernel plumpness. Six-rowed, 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.

OTHER VARIETIES

Azure—High yield. Medium maturity. Six-rowed, semi-smooth awn, long rachilla hairs, blue aleurone. *Classified as a malting variety 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 in Minnesota 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. Medium maturity. Six-rowed, 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.

Bowman—Medium yield. Medium maturity. Very good kernel plumpness. Medium lodging resistance. Two-rowed, smooth awns, long rachilla hairs, and colorless aleurone. Not approved for malting and brewing by AMBA. Limited demand for two-rowed malting type in Minnesota. Similar to Robust in resistance to leaf diseases; resistant to stem rust. Susceptible to loose smut. Developed by North Dakota Agricultural Experiment Station from cross involving several parents. Released in 1984.

Glenn—Medium yield. Early. Good lodging resistance. Six-rowed, 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.

Hazen—High yield. Medium maturity. Good kernel plumpness and good lodging resistance. Six-rowed, semi-smooth awn, long rachilla hairs, colorless aleurone. Not approved for malting and brewing by AMBA. 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.

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

Donald Rasmusson, University of Minnesota barley breeder, has developed several high yielding malting varieties such as this one being grown in a test plot at the West Central Experiment Station, Morris.

Table 5. Yields of barley varieties in bushels per acre, 1984-87

Variety	Location						Average 18 locations
	Crookston 4 ¹	Morris 4	Stephen 3	St. Paul 4	Roseau 3		
Larker	81	78	70	62	—	—	
Morex	85	84	77	67	56	75	
Robust	87	82	78	71	66	78	
Azure	88	85	78	78	64	80	
Hazen	88	84	79	75	62	79	
LSD 5%	6	8	6	6	5	3	

¹Number of trials.

Table 6. Characteristics of barley varieties, 1982-87

Variety	Head day (June)	Height (inches)	Lodging (percent)	Plump kernels (percent)	Seeds/ pound (number)	Stem ¹ rust	Spot ¹ blotch	Net blotch (1-5) ²
Larker	22	32	36	85	13,185	R	S	3.7
Morex	21	33	32	82	13,049	R	MR	2.9
Robust	24	33	25	85	11,536	R	R	1.7
Azure	23	33	29	87	12,380	R	R	2.0
Hazen	24	32	27	90	12,333	R	R	2.1

¹R = resistant, MR = moderately resistant, S = susceptible. ²1 = 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.

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, 87	Rosemount 1982,84	Average 7 locations
Mancan	1511	809	418	1046	964	832	1442	1003
Manor	1832	765	393	952	1210	768	1569	1070
Winsor Royal	1716	859	389	1096	1262	887	1662	1124
LSD 5%	286	226	46	280	335	158	242	91

Table 8. Characteristics of buckwheat varieties, seven location average

Variety	Planting to bloom (days)	Lodging (score) ¹	Height (inches)	Weight/ 100 seeds (grams)	Seeds/ pound (number)	Test weight/ bushel (pounds)
Mancan	32	4.6	40	2.8	15,770	44
Manor	32	4.5	40	2.8	16,256	44
Winsor Royal	32	4.1	40	2.9	15,230	44

¹1 = erect, 9 = flat.

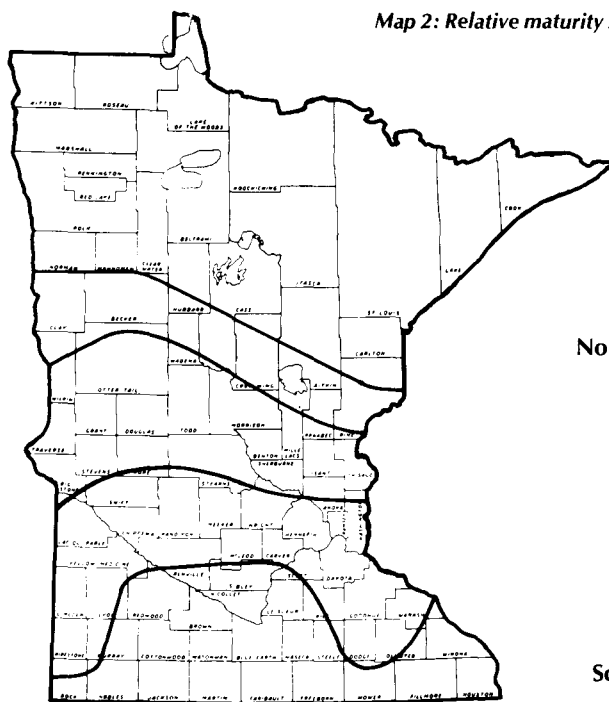
CORN

Many corn hybrids are produced by private companies. A total of 1,459 hybrids were registered for sale in Minnesota in 1987. Information on the performance of these closed-pedigree or private hybrids is usually available from the companies selling them.



Development of new corn inbreds is accomplished by controlling pollination of silks. Promising inbreds are released for use by private companies developing new hybrids.

Map 2: Relative maturity zones for corn hybrids in Minnesota.



Northern Zone (75, 80 or 85 RM)

North Central Zone (90 RM)

Central Zone (95 or 100 RM)

South Central Zone (105 RM)

Southern Zone (110 or 115 RM)

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 "Ainchinch," 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 adap-

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

GRAIN SORGHUM

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

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

Companies enter hybrids in these trials voluntarily, and adapted hybrids are usually tested for 3 years. Data reported for hybrids

not included in all trials are adjusted to be comparable with average data of all hybrids tested.

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



Grain Sorghum hybrids have been tested for maturity and adaption to Minnesota's climate and growing conditions. Sorghum is not widely grown in the state at this time.

Table 10. Characteristics of grain sorghum hybrids in central and northern maturity zones, 1983-84

Hybrid and company	Grain yield ¹			Head moisture ²			Test weight	Planting to heading	Lodging
	Morris	Crookston	Grand Rapids	Morris	Crookston	Grand Rapids			
	-----lbs/a-----			-----percent-----			lbs/bu	days	percent
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 ³	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			

¹Oven-dry. ²September 21-29. ³1984.

Table 11. Characteristics of grain sorghum hybrids at Lamberton

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

¹Oven-dry. ²1978, 81-84. ³1978-79, 81, 82, 84. ⁴1978-79, 81-84. ⁵1978-79, 82. ⁶1982-84. ⁷1981-83. ⁸1983-84. ⁹1978-79, 81-82. ¹⁰1978-79, 81. ¹¹1982, 84. ¹²1984.

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 FORAGE VARIETY

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

RECOMMENDED GRAIN VARIETIES

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.

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

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

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

Table 12. Yields of millet varieties, 1983-85

Type and variety	Grain ¹			Forage ²		
	Rosemount	Becker	Average	Rosemount	Becker	Average
----- lbs/a -----						
Foxtail						
Empire	1950	570	1260	8837	6048	7443
Proso						
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

¹10 percent moisture basis. ²Dry matter basis and includes grain.

Table 13. Characteristics of millet varieties, two location average

Type and variety	Planting to		Lodging	Height	Seeds/pound	Test weight
	heading	maturity				
----- days -----						
Foxtail			score ¹	inches	thousands	lbs/bu
Empire	59	99	2.8	47	239	47
Proso						
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

¹1 = erect, 9 = flat.

OAT

RECOMMENDED VARIETIES

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, some tolerance to red leaf. Selected at the

Illinois Agricultural Experiment Station. Released in 1985.

Hazel—Medium maturity, high yield, good lodging resistance, high test weight, very high groat percent, medium protein percent, ivory seed. Resistant to crown rust, susceptible to smut, tolerant to red leaf. Se-

lected at the Illinois Agricultural Experiment Station from a cross involving Clintford and Portal. Released in 1985. *Because of smut susceptibility, we recommend planting only treated seed.*

Moore—Late, medium yield, tall, fair lodging resistance, medium test weight and

groat percent, low protein percent, white seed. Some resistance to crown rust and smut. Selected at Minnesota Agricultural Experiment Station from a cross between Lodi and Mn 65B 1286, a crown rust resistant selection. Released in 1979.

Preston—Early, medium yield and height, good lodging resistance, high test weight, medium groat percent, high 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 Dal and Otee. Released in 1982.

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

Starter—Early, high yield, very good lodging resistance, high test weight and groat percent, medium protein percent, yellow seed. Some resistance to crown rust, resistant to smut, some tolerance to red leaf. Selected at the Minnesota Agricultural Experiment Station from a cross involving Noble and a Dal derivative. Released in 1986.

Steele—Late, high yield, tall, fair lodging resistance, high test weight, medium groat percent, medium protein percent, white seed. Resistant to crown rust, some resistance to smut, some tolerance to red leaf. Selected at North Dakota Agricultural Experiment Station from a cross between Dal derivative and Noble. Released in 1984.

VARIETIES NOT ADEQUATELY TESTED

Hytst—Medium maturity, yield and height, poor lodging resistance, very high test weight, high groat percent, medium protein percent, cream color seed. Susceptible to crown rust, resistant to smut. Selected at the South Dakota Experiment Station from a cross involving Dal, Nodaway 70 and Moore. Released in 1986.

Sandy—Late, medium yield, tall, poor lodging resistance, high test weight, medium groat percent, medium protein percent, cream color seed. Susceptible to crown rust, smut, and red leaf. Selected at the South Dakota Experiment Station from a cross involving Dal, Nodaway 70 and Moore. Released in 1986.

OTHER VARIETIES

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.

Lyon—Medium-late maturity, medium yield, tall, poor 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.

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

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.

Pierce—Late, high yielding, tall, fair lodging resistance, high test weight, medium groat percent, medium 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.

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.



Deon Stuthman, University of Minnesota oat breeder, tested the new variety Hazel at the West Central Experiment Station, Morris. This variety is new to the "recommended" list this year.

Table 14. Yield of oat varieties in bushels per acre, 1985-87

Variety	Rosemount	Waseca	Lamberton	Morris	Crookston	Grand Rapids	Average	
							6 locations	Roseau
Starter	88	104	96	116	114	74	99	95
Preston	86	98	84	103	108	73	92	83
Don	90	123	102	145	119	92	112	—
Hytest ^a	86	88	61	102	110	77	87	—
Ogle	86	111	71	97	113	92	95	94
Hazel	89	113	87	135	119	78	104	—
Steele	101	110	66	138	110	91	102	104
Moore	88	102	63	100	122	77	92	93
Proat	87	104	73	119	109	83	96	89
Sandy ^a	77	104	44	112	111	87	89	—
LSD 5%	7	10	11	9	11	8	4	11

^a1987 onlyTable 15. Characteristics of oat varieties, 1985-87^a

Variety	Heading (date)	Height (inch)	Lodging (score) ^b	Test wt/bu (lbs)	Groats (%)	Protein %		Protein/acre (lbs)	Reaction to disease ^c	
						groats	seed		crown rust	smut
Starter	6-17	33	1.2	41	75	17.9	13.5	423	MS-S	MR
Preston	6-18	35	1.5	40	74	19.3	14.3	419	S	HR
Don	6-19	33	1.8	42	75	15.5	11.7	420	HR	MR
Hytest ^d	6-21	40	1.9	43	78	17.7	13.9	391	S	MR
Ogle	6-22	35	1.5	36	75	15.1	11.2	341	S	S
Hazel	6-22	33	1.5	40	77	17.3	13.3	442	R	S
Steele	6-23	40	1.7	40	76	17.5	13.2	427	HR	MS
Moore	6-24	39	1.6	37	74	16.1	11.9	347	MS	MS
Proat	6-25	37	1.8	40	74	19.1	14.1	430	MR	MR
Sandy ^d	6-26	41	1.6	39	75	16.5	13.7	357	MR	S

^aDoes not include Roseau. ^b1 = erect; 5 = flat. ^cHR = highly resistant; R = resistant; MR = moderately resistant; MS = moderately susceptible; S = susceptible. ^d1987 only.

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, medium test weight, low seed weight. Satisfactory quality. Better adapted to northern Minnesota. Released by North Dakota Agricultural Experiment Station in 1975.

Monroe—Awned, early, medium height and fair lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield, medium test weight, high seed weight. Superior quality for export market. Released by North Dakota Agricultural Experiment Station in 1975.

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. Superior quality for export market. Released by North Dakota Agricultural Experiment Station in 1979.

VARIETIES NOT ADEQUATELY TESTED

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

rust. High yield, medium test weight and seed weight. Released by Agripro in 1987. Seed sale regulated by U.S. Variety Protection Act.

Medora—Awned, early, medium height and fair lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield and test weight, medium seed weight. Released in 1980 by Agriculture Canada, Winnipeg.

Stockholm—Awned, midseason, semidwarf and good lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield, medium test weight and seed weight. Released by Agripro in 1987. Seed sale regulated by the U.S. Variety Protection Act.

OTHER VARIETIES

Laker—Awned, midseason to late, semidwarf and good lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. Medium yield, test weight, and seed weight. Released by Western Plant Breeders in 1984. Seed sale regulated by the U.S. Variety Protection Act.

Lloyd—Awned, midseason to late, semidwarf and good lodging resistance. Re-

sistant to stem rust and moderately susceptible to leaf rust. Susceptible to glume blight. High yield, low test weight and low seed weight. Superior quality for export market. Better adapted to northern Minnesota. Released by North Dakota Agricultural Experiment Station in 1983.

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

Rugby—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. Released by North Dakota Agricultural Experiment Station in 1973.

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

Table 16. Characteristics of durum wheat varieties, 1985-87

Variety	Heading (days after May 31)	Height (inches)	Lodging (score) ¹	Rust reaction ²		Seeds/ pound (number)	Test weight/ bushel (pounds)	Yield/acre (bushels)			
				leaf	stem			Morris ³	Crookston	Stephen ⁴	Average
Cando	32	29	1.7	S	R	13,300	59.4	51	47	55	50
Lloyd	32	28	1.7	S	R	11,900	57.7	48	50	54	51
Monroe	28	36	1.9	MS	R	10,300	60.4	57	52	50	53
Vic	30	38	1.9	MS	R	10,900	60.7	57	50	47	51
Fjord	29	36	1.6	MR	R	11,200	60.8	55	50	47 ⁵	51
Laker	32	31	1.5	MS	R	11,300	59.3	47	50	45	48
Medora	29	37	1.9	MS	R	11,500	61.3	56	53	50 ⁵	53
Mindum	34	45	5.2	S	MS	11,700	61.5	50	41	39	43
Rugby	30	38	1.9	MS	R	11,300	61.2	59	47	49	51
Stockholm	30	29	1.5	MS	R	11,400	59.2	50	52	60 ⁵	54
Ward	30	38	2.2	MS	R	11,400	60.6	56	46	47	49
LSD 5%								8	8	—	6

¹1 = erect, 9 = flat. ²Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. ³1985,87 data only. ⁴1986-87 data only. ⁵Adjusted to 2 year average.

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

Guard—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 and susceptible to tan spot. Released by South Dakota Agricultural Experiment Station in 1983. Variety protection pending.

Len—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 and tan spot. Released by North Dakota Agricultural Experiment Station and USDA-ARS in 1979.

Marshall—Seed sale regulated by U.S. Variety Protection Act. Awned, midseason, semidwarf. Resistant to stem rust and moderately resistant to 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. Released by Minnesota Agricultural Experiment Station and USDA-ARS in 1982.

Stoa—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. Released by North Dakota Agricultural Experiment Station in 1984.

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



Agronomist Robert Busch and graduate students such as Dan Brotslaw are developing promising new hard red spring wheat varieties for Minnesota conditions. Trials are being conducted at Crookston, Lamberton, Morris, Waseca, and St. Paul.

VARIETIES NOT ADEQUATELY TESTED

Butte 86—Awned, early, medium height. Resistant to stem and leaf rust. Moderately tolerant of loose smut. High yield and test weight. Medium protein percent. Satisfactory milling and baking characteristics. Disadvantages—Moderately susceptible to tan spot, black chaff, and lodging. Released by North Dakota Agricultural Experiment Station in 1986.

Shield—Awned, early, medium height. Moderately susceptible to stem rust and resistant to leaf rust. High yield and medium test weight. Resistant to hessian fly. Medium protein percent. Satisfactory milling and baking characteristics. Disadvantages—Susceptible to shattering and moderately susceptible to lodging. Released by South Dakota Agricultural Experiment Station in 1987.

OTHER VARIETIES

Butte—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. Disadvantages—Susceptible to leaf rust and to black chaff. Moderately susceptible to tan spot and lodging. Very tough threshing. Released by North Dakota Agricultural Experiment Station and USDA-ARS in 1977.

Chris—Awnless, midseason, medium height. Resistant to stem rust and moderately resistant to leaf rust. Tolerant of ergot and moderately tolerant of loose smut. Low

yield and medium test weight. High protein percent. Satisfactory milling and baking. Disadvantages—Susceptible to lodging. Released by Minnesota Agricultural Experiment Station and USDA-ARS in 1965.

Era—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. Low protein percent. Satisfactory milling. Disadvantages—Low bake absorption. Because of later maturity, less suitable for late seeding in southern Minnesota. Released by Minnesota Agricultural Experiment Station in 1970.

PRIVATELY DEVELOPED VARIETIES

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

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

Buckshot—Awned, midseason, semidwarf. Resistant to stem rust and moderately susceptible to leaf 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. First marketed by Arrowhead in 1983, now Discount Farm Center. Seed sale regulated by U.S. Variety Protection Act.

Celtic—Awned, midseason, semidwarf. Resistant to stem and leaf rust. High yield and test weight. Medium protein percent. Satisfactory milling and baking. First marketed by Agripro in 1985. Seed sales regulated by the U.S. Variety Protection Act.

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

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

Norak—Awned, midseason, semidwarf. Resistant to leaf rust and moderately resistant to stem rust. Medium yield and test weight. Low to medium protein percent. Disadvantages—Low water absorption.



Small plot threshing equipment is used to harvest small samples of promising varieties during the early stages of variety development.

Table 17. Yields of hard red spring wheat varieties in bushels per acre, 1985-87

Variety	Crookston	Stephen ²	Roseau	Northern average	St. Paul	Morris	Lamberton	Waseca	Southern average	State average
Publicly developed varieties										
Guard	51	53	35	46	47	49	46	56	49	48
Len	50	48	32	43	42	41	43	48	43	43
Marshall	57	57	34	48	46	50	48	53	49	49
Stoa	62	55	44	54	42	50	51	61	51	52
Wheaton	57	62	37	51	46	53	51	59	52	52
Butte	50	51	33	44	41	42	43	50	44	44
Butte 86	54	49	34 ²	46	45	47	45 ²	57 ²	49	48
Chris	42	42	31	38	26	38	34	37	34	36
Era	52	57	34	46	44	43	45	50	46	46
Shield ¹	50	42	39	44	50	50	49	55	51	48
Privately developed varieties										
Apex 83	54	46	35	45	47	43	40	50	45	45
A99AR	50	57	47	51	37	47	40	54	44	47
Buckshot	51	55	36	46	42	43	45	51	46	46
Celtic	58	50	38	48	48	44	45	55	48	48
Challenger	52	50	36	45	43	44	39	53	45	45
Leif ¹	47	48	31	42	44	39	39	53	44	43
Norak	53	49	33	44	44	41	41	50	44	44
Nordic	53	63	38 ²	51	52	50	52 ²	55 ²	52	52
Norseman	60	54	37	50	47	45	49	55	49	50
Success	55	57	40	50	42	47	48	52	47	49
Tammy	53	51	39	47	47	44	39	52	46	47
Telemark	51	53	33	46	47	44	44 ²	54 ²	47	47
2369	55	54	39	49	46	47	46	55	49	49
LSD 5%	9	10	7	5	8	7	6	8	4	3

¹1985, 1987. ² 1986-87. Data adjusted to 3-year average.

Table 18. Characteristics of hard red spring wheat varieties, 1985-87

Variety	Heading (June)	Height (inches)	Lodging (score) ¹	Rust reaction ²		Seeds/pound (number)	Test weight/bushel (pounds)	Wheat protein (percent) ³	Milling and baking quality
				leaf	stem				
Publicly developed varieties									
Guard	20	30	2	R	MR	13,500	61	13.7	med.
Len	24	30	2	MR	R	13,300	60	14.8	high-med.
Marshall	24	29	2	MR	R	14,600	61	13.2	med.-low
Stoa	22	36	2	R	R	13,900	60	14.4	med.-high
Wheaton	23	29	2	R	R	13,000	59	13.2	low-med.
Butte	19	31	3	S	R	14,100	61	13.8	med.-high
Butte 86	18	32	2	R	R	12,800	61	14.2	med.-high
Chris	24	36	4	MR	R	15,000	60	15.1	v. high
Era	25	29	2	MR	R	15,300	60	13.3	low-med.
Shield	18	34	2	R	S	12,700	60	14.0	med.
Privately developed varieties									
Apex 83	19	29	2	MR	MS	12,600	60	13.4	low-med.
A99 AR	24	38	3	R	R	10,800	60	14.1	low
Buckshot	23	30	2	MS	R	12,500	60	13.9	med.
Celtic	22	31	2	R	R	12,900	61	14.4	med.
Challenger	19	29	2	MR	MS	12,600	61	13.4	low-med.
Leif	23	32	2	R	R	12,600	61	14.4	low-med.
Norak	24	29	2	R	MR	13,200	60	13.5	low
Nordic	23	31	2	MR	R	12,800	61	12.5	low
Norseman	23	28	2	R	R,S	13,400	59	14.0	med.-low
Success	26	33	2	R	R	12,600	60	13.6	low-med.
Tammy	24	31	2	MR	S	12,600	59	14.0	med.-low
Telemark	22	27	2	MR	R	13,400	60	14.3	med.-high
2369	22	30	2	MS	MR	12,800	61	13.8	low-med.

¹1 = erect, 9 = flat.

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

³12 percent moisture.

First sold by SeedTec in 1985. Seed sale regulated by the U.S. Variety Protection Act.

Nordic—Awned, midseason, semidwarf. Resistant to stem rust and moderately resistant to leaf rust. Moderately tolerant of loose smut. Moderately tolerant to tan spot. Very high yield and test weight. Disadvantage—low protein percent. First marketed by Agripro in 1986. Seed sales regulated by the U.S. Variety Protection Act.

Norseman—Awned, midseason, semidwarf. Resistant to leaf rust, and mixed resistant-susceptible to stem rust. Good lodging resistance. Very high yield and low test weight. Low to medium protein percent.

WINTER WHEAT

Cultural practices have a major effect on winter survival of all winter wheats. Planting into a firm seedbed with at least some stubble remaining to retain snow cover can reduce winterkill.

RECOMMENDED VARIETIES

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

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

VARIETY NOT ADEQUATELY TESTED

Thunderbird—Awned, early, semidwarf with good lodging resistance. Moderately

Disadvantage—Low bake absorption. First marketed by Agripro in 1984. Seed sale regulated by U.S. Variety Protection Act.

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

Tammy—Awned, midseason semidwarf. Resistant to leaf rust and susceptible to stem rust. High yield and low test weight. Medium protein percent. First sold by World Seeds, Inc. in 1985. Seed sale regulated by the U.S. Variety Protection Act.

winterhardy. Moderately resistant to leaf rust and moderately susceptible to stem rust. High yield and test weight. Released by Agripro in 1986. Seed sale regulated by U.S. Variety Protection Act.

OTHER VARIETIES

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

Bighorn—Awned, early, semidwarf with good lodging resistance. Winterhardy. Susceptible to leaf and stem rust. High yield and low test weight. Satisfactory quality. Sold by SeedTec in 1984. Seed sale regulated by U.S. Variety Protection Act.

Brule—Awned, early, semidwarf with good lodging resistance. Winterhardiness is not satisfactory. Moderately susceptible to leaf rust and resistant to stem rust. Very high yield and medium test weight. Satisfactory quality. Released by Nebraska Agricultural Experiment Station and USDA-ARS in 1982.

Telemark—Awned, midseason, semidwarf. Resistant to stem rust and moderately resistant to leaf rust. Moderately tolerant of loose smut. Medium to high yield and test weight. Medium protein percent. Satisfactory quality. First marketed by Agripro in 1986. Seed sales regulated by the U.S. Variety Protection Act.

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

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

Minter—Awned, late, tall, with poor lodging resistance. Winterhardy. Moderately susceptible to leaf and 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—Awned, late, tall, with fair lodging resistance. Winterhardy. Susceptible to leaf and stem rust. Medium yield and test weight. Satisfactory quality. Licensed by Agriculture Canada in 1978.

Siouxland—Awned, very early, medium height with medium lodging resistance. Winterhardiness is not satisfactory. Resistant to leaf and stem rust. High yield and medium test weight. Released by Nebraska Agricultural Experiment Station and USDA-ARS in 1984. Seed sale regulated by U.S. Variety Protection Act.

Table 19. Characteristics of winter wheat varieties, 1985-87

Variety	Heading (June)	Height (inches)	Winter survival (percent)	Lodging (score) ¹	Rust reaction ²		Test weight/bushel (pounds)	Yield/acre (bushels)				
					leaf	stem		Rosemount	Morris	Crookston ³	Roseau ⁴	Average
Rose	6	36	72	2.0	S-MS	MS	61.5	37	46	63	43	44
Roughrider	7	39	85	3.8	S	R	60.4	35	48	54	44	43
Agassiz	9	41	80	2.9	S	R	60.2	31	44	50	55	41
Bighorn	7	33	76	2.3	S	S	58.9	42	41	73	57	47
Brule	5	35	69	1.9	MS	R	59.1	35	51	67	62	48
Minter	11	41	90	5.8	MS	R	60.0	28	43	48	46	38
Norstar	11	44	81	2.5	S	S	60.1	28	42	51	54	39
Siouxland	2	35	64	2.6	R	R	59.4	39	36	75	56	45
Thunderbird	3	33	73	1.9	MR	MS	60.7	39 ⁵	44 ⁵	70	44	45
LSD 5%								11	12	16	13	11

¹1 = erect, 9 = flat. ²Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. ³1986; winter killed 1985 and 1987. ⁴1987. ⁵1985-87 data adjusted to 3-year average.

WILD RICE

Cultivated wild rice is grown on 25,000 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 low to medium yield. Large seed size. Reduced foliage in the canopy compared to other varieties. Developed by Minnesota Agricultural Experiment Station and released in 1985.

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



Freshly harvested wild rice seed is unloaded in long rows on a pad as the first processing step for this unique crop. Specialized machines will later turn and mix these rows while adding water to facilitate the curing process.

Table 20. Characteristics of wild rice varieties

Variety	Yield/acre (pounds) ¹		1981-1986 ³		Seeds per pound ⁴
	1986 ²	1981-86	Harvest (August)	Height (inches)	
K2	1864	1578	23	73	7300
M3	1637	1613	27	73	9460
Meter	916	1078	2	51	6880
Netum	—	1497	17	69	8300
Voyager	1384	1500	18	66	8600
LSD 5%	192	156	—	4	—

¹Adjusted green weight of grain at 40% moisture. only. ⁴Seeds per pound based on wet, stored seed.

²1986 data from Grand Rapids and Rosemount.

³1986 data from Grand Rapids

WINTER RYE

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

RECOMMENDED VARIETIES

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

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

Rymin—High yield, fair winterhardiness, medium late, medium height, and good lodging resistance. Large seed of predominantly greenish-gray color and high test weight. Originated by Minnesota Agri-

cultural Experiment Station from a cross of Von Lochow and WR5. Released in 1973.

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

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 sta-

tions 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.

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, and poor lodging resistance. Small seed of pre-

dominantly 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, and 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 1982-86	Crookston 1982-86	Grand Rapids 1982-86	Average 5 locations
Hancock	59	46	57	62	48	54
Musketeer	58	47	60	72	47	57
Rymin	58	50	60	67	50	57
Dankowskie Nowe	61 ¹	47 ¹	62 ²	57 ²	19 ²	49
LSD 5%	2	4	3	5	4	2

¹1985. ²1982-85.

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

Variety	Winterkill (percent)	Heading (May)	Mature (July)	Lodging (score) ¹	Height (inches)	Seeds/ pound (number)	Test weight/ bushel/ (pounds)
Hancock	9	30	23	2.9	53	15,600	55
Musketeer	4	29	22	3.1	53	16,200	56
Rymin	6	30	23	2.7	52	16,200	56
Dankowskie Nowe	12	31	25	2.4	49	14,600	56

¹1 = erect, 9 = flat.



Canola

Oilseed Crops

FLAX

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.

Verne—High yield, particularly when sown late. Early maturity, good lodging resistance. Blue flowers, brown seed. Excellent resistance to rust and wilt, moderately resistant to pasmo. Released in 1987 by Minnesota Agricultural Experiment Station.

VARIETY 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, 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, very resistant to lodging. Brown seed, blue flowers. 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.

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.

Table 23. Yields of flax varieties

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
-----bu/a-----								
Dufferin	25	16	15	15	31	19	34	20.7
Rahab	26	17	14	18	31	18	34	20.7
Verne	26	16	16	17	29	19	34	20.8
Clark	23	15	13	16	27	17	33	18.9
Culbert	24	14	13	17	26	18	33	19.1
Culbert 79	24 ¹	13 ¹	12 ¹	19 ³	22 ¹	16 ⁴	30	18.1
Flor	24	16	14	13	29	17	33	19.5
Linton	24 ¹	15 ¹	14 ¹	13	24 ¹	20 ⁴	33	19.3
McGregor	28 ¹	16 ¹	14 ¹	17 ³	26 ¹	17 ⁴	34	20.2
NorLin	24 ¹	19 ¹	16 ¹	18 ³	28 ¹	17 ⁴	34	20.9
NorMan	24 ²	17 ²	15 ²	21	31 ²	19 ⁵	34	21.0
LSD 5%	2	2	2	4	4	2	2	0.4

¹1981-82, 85. ²1982-85. ³1985. ⁴1981-82. ⁵1982-84.

Table 24. Characteristics of flax varieties

Variety	Oil % ¹	Test weight lbs/bu	Seeds/ pound no.	Planting to bloom		Lodging score ²	Height inches	Disease reaction		
				first ----- days -----	full			Wilt	Pasmo	Rust
								score ³		rating ⁴
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
Verne	41	53	82,470	51	56	3.3	22	1.6	3.1	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

¹Oven-dry. ²1 = erect, 9 = flat. ³1 = best, 9 = poorest. ⁴R = 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 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 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.



Canola varieties are being evaluated as possible additions to Minnesota's array of crops.

YELLOW MUSTARD VARIETIES

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

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

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

Tilney—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.

ORIENTAL MUSTARD VARIETIES

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

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

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

BROWN MUSTARD VARIETY

Blaze—Released by Agriculture

Canada, Saskatoon. Licensed in 1976.

CANOLA OILSEED RAPE VARIETIES

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

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

Global—Developed by Svalof A.B., Plant Breeding Station, Sweden. Distributed by Bonis and Company Ltd., Lindsay, Ontario, Canada.

Hyola 70—Hybrid developed by Contiseed Ltd. (Canada) to be marketed in U.S. in 1988, by Contiseed, Huron, SD.

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

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

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

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

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

CANOLA TURNIP RAPE VARIETIES

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

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

OILSEED RAPE VARIETY

Reston—Over 40 percent erucic acid in oil and less than 0.1 percent glucosinolate in meal. Originated by University of Manitoba. Licensed in 1982.

TURNIP RAPE VARIETY

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

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

Crop and variety	Seed yield				
	Roseau 1981-82,84-85	Crookston 1980-81,85	Rosemount 1979-83,87	Waseca 1987	Lamberton 1987
----- lbs/a -----					
Yellow mustard (<i>Brassica hirta</i>)					
Kirby	1524	868	1144 ⁵	—	—
Ochre	1494	927	1222 ⁴	—	—
Tilney	1861 ¹	1473 ¹	1041 ²	—	—
Oriental mustard (<i>Brassica juncea</i>)					
Domo	1437	972 ²	1626 ⁴	—	—
Brown mustard (<i>Brassica juncea</i>)					
Blaze	1585	973	1466 ⁴	—	—
Canola oilseed rape (<i>Brassica napus</i>)					
Andor	1774 ³	1507 ¹	1229 ³	363	693
Hyola 70	—	—	569 ¹	154	1087
Global	2505 ¹	1051 ¹	518 ¹	277	665
OAC Triton	1415 ²	954 ¹	593 ¹	225	510
Topas	1651 ¹	1058 ¹	612 ¹	170	604
Tribute	—	—	427 ¹	293	536
Westar	2359 ²	1377 ¹	634 ²	338	1220
Canola turnip rape (<i>Brassica campestris</i>)					
Tobin	1145 ³	876 ¹	1161 ³	404	920
Oilseed rape (<i>Brassica napus</i>)					
Reston	1516 ³	1600 ¹	1136 ³	227	527
Turnip rape (<i>Brassica campestris</i>)					
R-500	—	—	1199 ²	647	552
LSD 5%	275	225	165	181	276

¹One year data. ²Two year data. ³Three year data. ⁴Four year data. ⁵Five year data.

Table 26. Characteristics of mustard, canola, and oilseed rape varieties.

Crop and variety	Oil ¹ %	Test weight lbs./bu.	Seeds/ pound thousand	Planting to		Lodging ² score	Height inches
				bloom	maturity		
				----- days -----			
Yellow mustard (<i>Brassica hirta</i>)							
Kirby	27	55	89	43	94	3	41
Ochre	27	55	91	41	92	4	39
Tilney	31 ³	54	94	42	94	2	45
Oriental mustard (<i>Brassica juncea</i>)							
Domo	38 ⁴	52	168	45	94	4	45
Brown mustard (<i>Brassica juncea</i>)							
Blaze	35	53	189	47	94	4	45
Canola oilseed rape (<i>Brassica napus</i>)							
Andor	46	50	137	51	98	6	41
Hyola 70	47 ⁵	—	—	55	88	1	37
Global	45 ⁴	51	133	59	99	4	45
OAC Triton	44	51	116	56	100	5	36
Topas	46 ⁴	51	156	58	98	4	42
Tribute	39 ⁵	—	—	55	88	1	32
Westar	47	51	123	52	93	5	41
Canola turnip rape (<i>Brassica campestris</i>)							
Tobin	43	52	197	43	89	5	34
Oilseed rape (<i>Brassica napus</i>)							
Reston	46	50	146	53	97	5	42
Turnip rape (<i>Brassica campestris</i>)							
R-500	40	49	93	46	95	2	33

¹Oven-dry basis, 4 year/location average; ²1 = erect, 9 = flat; ³2 year/location average; ⁴3 year/location average; ⁵1 year/location.

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 this section's tables.

Tables 28 to 34 deal with varieties that were developed by publicly supported institutions and are being considered for recommendation by Minnesota Agricultural Experiment Station.

Tables 35 to 37 show performance characteristics of privately developed varieties as well as several public varieties. Recommendations are not made for private varieties because they are voluntarily submitted by the companies 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 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 higher yield potential than earlier maturing varieties. When comparing yields, it is best to look within a maturity range of about 5 days. Yield comparisons are more reliable if data are available for several years. Data from different tables should not be compared. All yield data reported in these tables were obtained from replicated tests harvested with a plot combine.

Row Spacing—Research conducted over many years and many locations has shown that yields from narrow rows (10 inches to 18 inches) are higher than wide rows (20 inches to 40 inches). Although rankings of varieties can change with row spacing, top performers in a wide spacing should be among the top performers in a narrow spacing.

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 val-

ues 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.

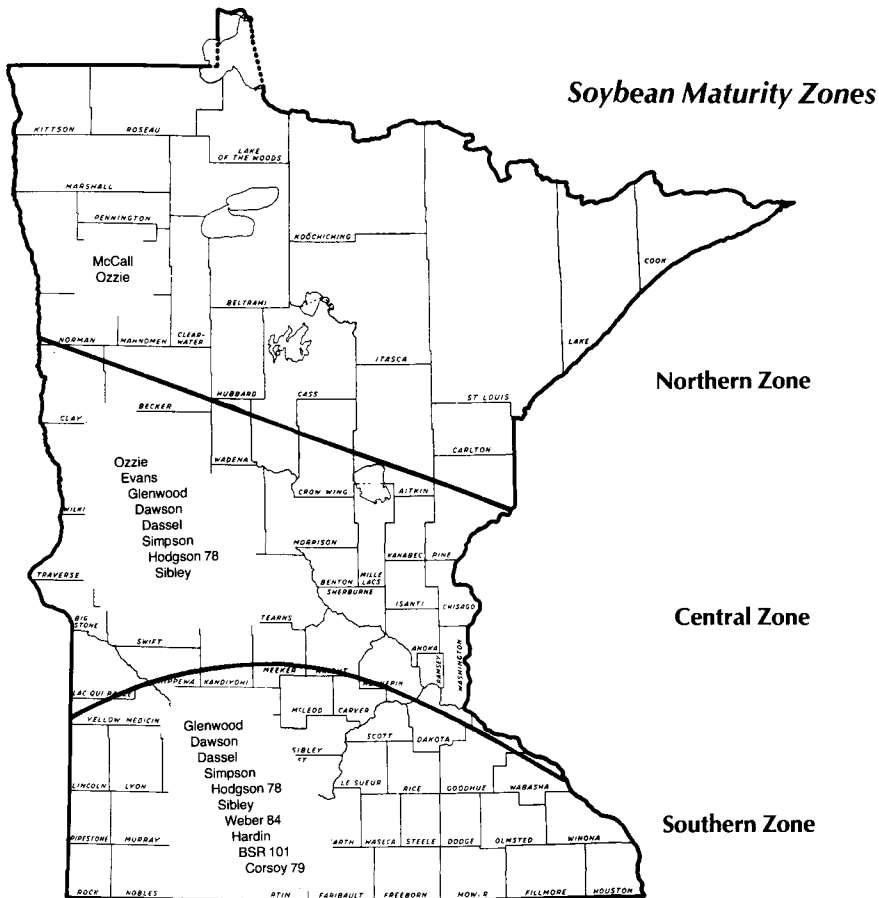
Chlorosis—The chlorosis score listed for each variety is a measure of how much leaf yellowing occurred in tests conducted on a high lime (high pH) soil near Lamberton. This score indicates how well a variety will perform on high lime soils.

Phytophthora—Phytophthora root rot can cause significant yield losses when susceptible varieties are planted in poorly drained fields. Since there are several races of this fungus, it is important to know which are present in a field. Several genes can be incorporated into varieties to provide complete resistance to specific races.

Table 27. Genes for resistance to races of Phytophthora root rot.

Gene	Races
Rps1	1, 2, 10, 11, 13-18, 24
Rps1-c	1-3, 6-11, 13, 15, 17, 21, 23, 24
Rps1-k	1-11, 13-15, 17, 18, 22, 24
Rps3	1-5, 8, 9, 11, 13, 14, 16, 18, 23, 25
Rps6	1-4, 10, 12, 14-16, 18-21, 25

Some information refers to "tolerance"



Map 3: Recommended public varieties of soybeans for various maturity zones in Minnesota.

or "field resistance" which is non race-specific and should not be confused with race specific resistance. Reliable tests for tolerance have not yet been developed. The genes present were determined based on data from greenhouse plants grown by the University of Minnesota's Department of Plant Pathology, and on information supplied by the companies.

Brown Stem Rot—Brown stem rot is a fungal disease that can cause yield losses in certain situations. The disease occurs most frequently when soybeans follow soybeans but can occur where soybeans are planted every other year. Resistant varieties, (currently only BSR101 and BSR201) or longer rotations out of soybeans, assist in the control of this disease.

Powdery Mildew—In 1985 conditions were favorable for the development of powdery mildew. The reactions to powdery mildew, reported in the table of public varieties, were determined on field grown plants under natural infestations by members of the Department of Plant Pathology.

Performance data for public and private soybean varieties are presented in northern, central and southern zone tables. 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.

Row spacings vary in some tables.

RECOMMENDED VARIETIES

BSR 101—Southern zone. Similar in maturity to Corsoy 79. High yield potential and moderate resistance to brown stem rot. Acceptable iron chlorosis score. *Rps1* gene for resistance to phytophthora. Developed by Iowa Agricultural Experiment Station. Released in 1985.

Corsoy 79—Southern zone. Very good yield performance. *Rps1-c* gene for phytophthora resistance. Has poor chlorosis ratings and is somewhat lodging susceptible. Developed by Illinois Agricultural Experiment Station. Released in 1979.

Dassel—Central and southern zones. Yield similar to Evans. Good lodging resistance. *Rps6* gene for resistance to phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1986. Seed sale regulated by U.S. Variety Protection Act.

Dawson—Central and southern zones. Very good tolerance to iron chlorosis on high lime soils and higher yielding than Swift. Good lodging resistance. *Rps1* gene for resistance to phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1983. Seed sale regulated by U.S. Variety Protection Act.

Evans—Central zone. *Rps1* gene for re-

sistance to 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.

Glenwood—Central and southern zones. One to two days later than Evans. High yield with good lodging resistance. Outstanding protein level. *Rps1* gene for resistance to phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1987. Seed sale regulated by U.S. Variety Protection Act.

Hardin—Southern zone. Earlier than Corsoy, good yield performance. *Rps1* gene for resistance to 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 *Rps1* gene for resistance to 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. *Rps1* gene for resistance to Phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1983. Seed sale regulated by U.S. Variety Protection Act.

Sibley—Central and southern zones. One day later than Hodgson 78. Higher yielding and higher protein and oil than Hodgson 78. *Rps1* gene for resistance to phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1986. Seed sale regulated by U.S. Variety Protection Act.

Simpson—Central and southern zones. High yield with good lodging resistance. *Rps1* gene for resistance to phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1982. Seed sale regulated by U.S. Variety Protection Act.

Weber 84—Southern zone. Similar to Weber except *Rps1* gene for resistance to phytophthora. Developed by Iowa Agricultural Experiment Station. Released in 1984.

VARIETIES NOT ADEQUATELY TESTED

Elgin 87—Matures several days later than Corsoy 79. *Rps1-k* gene for resistance to phytophthora. Has poor iron chlorosis ratings. Fair lodging resistance. Developed by Iowa Agricultural Experiment Station. Released in 1987. Seed sale regulated by U.S. Variety Protection Act.

Hoyt—Matures about three days later than Corsoy 79. Good lodging resistance. Determinate variety. *Rps1* gene for resistance to phytophthora. Developed by Ohio

Agricultural Experiment Station. Released in 1986.

Maple Donovan—Slightly later than Evans in maturity. *Rps6* gene for resistance to phytophthora. Developed by Agriculture Canada, Ottawa. Licensed in 1986. Production of certified seed limited to Canada.

OTHER VARIETIES

Bicentennial—Matures about 6 days later than McCall. Medium yield potential. *Rps1* gene for resistance to phytophthora. Developed by University of Guelph. Licensed in 1985.

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. *Rps1* gene for resistance to phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1983.

Hack—Matures several days later than Corsoy 79. High yield potential but not tolerant to iron chlorosis on high lime soils. Good lodging resistance. *Rps1* gene for resistance to phytophthora. Developed by Illinois Agricultural Experiment Station. Released in 1984.

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.

Maple Amber—Matures 6 days earlier than McCall. High percentage of oil and protein for its maturity. *Rps1* gene for resistance to phytophthora. Developed by Agriculture Canada, Ottawa. Licensed in 1982.

Maple Arrow—Matures about 6 days later than McCall. *Rps6* gene for resistance to phytophthora. Developed by Agriculture Canada, Ottawa. Licensed in 1976.

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.

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

Vickery—Essentially the same as Corsoy 79. *Rps1-c* gene for resistance to phytophthora. Developed jointly by the Iowa and Ohio Agricultural Experiment Stations. Released in 1978. Seed sale regulated by U.S. Variety Protection Act.

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

PRIVATELY DEVELOPED VARIETIES

The private companies entering varieties in the 1987 Minnesota tests and the brand names were:

AgriPro, Route 2, Hwy 30 East, Ames, IA 50010 (AgriPro);

Asgrow Seed Company, 7000 Portage Road, Kalamazoo, MI 49001 (Asgrow);
Custom Farm Seed, P.O. Box 160, Mokense, IL 60954 (CFS);

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 Seed Company, 1127 Plaza Drive, Carroll, IA 51401 (Diamond);

Domestic Seed and Supply, Inc., Box 466, Madison, SD 57042 (Mustang);

Ehrich Seed Farm, Route 1, Elmore, MN 56027 (Ehrich);

Farmacy Seed Company, Route 2, Box 123, Dodge Center, MN 55927 (Farmacy);

Funk Seeds International, 1300 West Washington, Box 2911, Bloomington, IL 61702 (Funk);

Garst Seed Company, Box 300, Coon Rapids, IA 50058 (Garst);

Green Field Seed, P.O. Box 56, Comfrey, MN 56019 (GFS);



Developing and testing high yielding disease resistant varieties of soybean, such as Hodgson 78, are a major responsibility of scientists at the Minnesota Agricultural Experiment station.

Hoffman Seed Farms, Inc., Route 1, Box 148, Iowa Falls, IA 50126 (Hoffman);

Hofler Seed Company, P.O. Box 426, Nora Springs, IA 50458 (Hofler);

Hy-Vigor Seeds, Route 1, Paullina, IA 51046 (Hy-Vigor);

Interstate Seed Company, Box 338, West Fargo, ND 58078 (IS);

Jacques Seed Company, 720 St. Croix St., Prescott, WI 54021 (Jacques);

Kaltenberg Seed Farms, 5506 Hwy 19, Route 2, Waunakee, WI 53597 (Kaltenberg);

King Grain, Inc., P.O. Box 1088, Chatham, Ontario, Canada, N7M 5L6 (King Grain);

Kruger Seed Company, P.O. Box A, Hwy 20 East, Dike, IA 50624 (Kruger, DeSoy);

Latham Brothers Farms, Rt. 1, Box 12, Alexander, IA 50420 (Latham);

Latham Seed Company, Rt. 1, Box 12, Alexander, IA 50420 (Latham);

Lynks Seeds, Box 637, Marshalltown, IA 50158 (Lynks);

Midwest Oilseeds, Inc., Route 3, Box 204, Adel, IA 50003 (Midwest Oilseeds);

NC + Hybrids, 3820 North 56 St., P.O. Box 4408, Lincoln, NE 68504 (NC +);

Northrup King Co., P.O. Box 959, Minneapolis, MN 55440 (Northrup King);

Pioneer Hi-Bred International, Inc., 130 SE Willmar Ave., Willmar, MN 56201, (Pioneer);

Pride Company, Inc., RFD Box 58, Glen Haven, WI 53810-9776 (Pride);

ProfiSeed Inc., Route 2, Hampton, IA 50441 (PS);

The J.C. Robinson Seed Co., N. Hwy. 64, Waterloo, NE 68069 (Golden Harvest);

Rossbach Lakeside Seed Farms, Route 1, Hanska, MN 56041 (Rossbach Seed Farm);

Sand Seed Service, Inc., P.O. Box 648, Marcus, IA 51035 (SOI);

Schechinger Seed Company, Route 1, Harlan, IA 51537 (S-Brand);

SeedTec, Box 5692, Fargo, ND 58105 (SeedTec);

The Sexauer Company, 100 Main Avenue, P.O. Box 58, Brookings, SD 57006-0058 (Sexauer);

Sigco Research, Inc., Box 289, Breckenridge, MN 56520 (Sigco);

Soybean Research Foundation, 115 N. Perry St., Mason City, IL 62664 (SRF);

Stine Seed Farm, Inc., Route 3, Box 204, Adel, IA 50003 (Stine);

Terra International, 600 4th St., Sioux City, IA 51101 (Terra);

Thompson Agronomics, Inc., Leland, IA 50453 (Thompson);

Thompson Farms Seeds, Leland, IA 50453 (Thompson);

Tilney Farms, P.O. Box 115, Lewisville, MN 56060 (Tilney Farms);

Willette Seed Farm, Inc., Delavan, MN 56023 (Willette Seed Farm);

Wilson Hybrids, Inc., P.O. Box 391, Harlan, IA 51537 (Wilson Blend®);

Ziller Seed Company, Route 1, P.O. Box 122, Bird Island, MN 55310 (Ziller).

Table 28. Yields of publicly developed soybean varieties in northern zone in bushels per acre, 1985-87.

Variety	Crookston	Grand Rapids	Moorhead	Roseau
Maple Ridge	31	30	33	22
Maple Isle	30	27	33	20
Maple Amber	31	21	34	18
McCall	35	33	37	24
Bicentennial	32	28	38	33 ²
Chico	23	—	38	—
Maple Arrow	28	27	33	—
Ozzie	32	—	43	—
Evans	28	—	41	—
Dawson	33 ¹	—	39	—
Dassel	—	—	42	—
Glenwood	—	—	43	—
Maple Donovan	35 ¹	—	41 ¹	—
Simpson	—	—	45	—
LSD (5%)	3	5	3	4

¹1986-87. ²1987.

Table 29. Yields of publicly developed soybean varieties in 10 inch and 30 inch spacings, and three planting dates at Morris in bushels per acre, 1986-87.

Variety	mid-May planting		late-May planting		mid-June planting	
	10 inch	30 inch	10 inch	30 inch	10 inch	30 inch
McCall	—	—	41	34	34	28
Ozzie	47	38	48	38	29	24
Evans	49	40	52	40	32	32
Dawson	—	—	50	42	30	31
Swift	50	42	—	—	—	—
Hodgson 78	52	42	—	—	—	—
LSD 5%	5	5	5	5	5	5

Table 30. Yields of publicly developed soybean varieties in central zone in bushels per acre.

Variety	Rosemount	Morris	Becker	Average
	1983-87 10-inch	1983-87 10-inch	1983-87 30-inch	1983-87
McCall	41	40	—	40
Ozzie	45	45	45	45
Evans	44	47	44	45
Dawson	46	49	46	47
Dassel	45	46	47	46
Glenwood	50	52	47	50
Maple Donovan	49	50	45 ¹	49
Simpson	49	47	47	48
Swift	40	45	44	43
Hodgson 78	50	47	47	48
LSD 5%	3	3	2	2

¹1987 data only.

Table 31. Yields of publicly developed soybean varieties in 10 inch and 30 inch spacings at 5 planting dates at Waseca and Lamberton, in bushels per acre, 1986-87.

Varieties	early-May planting		mid-May planting		late-May planting		mid-June planting		late-June planting	
	10-inch	30-inch	10-inch	30-inch	10-inch	30-inch	10-inch	30-inch	10-inch	30-inch
Evans	—	—	—	—	—	—	40	38	30	29
Simpson	—	—	—	—	—	—	40	40	30	30
Sibley	53	48	51	50	47	45	40	38	32	30
Hardin	54	56	53	53	50	49	44	41	30	30
Corsoy 79	52	52	54	52	44	45	—	—	—	—
BSR 101	54	54	53	52	46	46	—	—	—	—
LSD 5%	4	4	4	4	4	4	4	4	4	4

Table 32. Yields of publicly developed soybean varieties in southern zone in bushels per acre, 1983-87.

Variety	Waseca and Lambertson		Fairmont mid-May planting 30-inch	Waseca mid-May planting 10-inch	Lamberton mid-May planting 10-inch	Average mid-May planting
	mid-May ¹ planting	mid-June ¹ planting				
McCall	—	33	—	—	—	—
Ozzie	43	37	44	39	46	43
Evans	44	37	43	42	47	44
Dawson	46	40	45	43	49	46
Glenwood	50	—	48	45	56	50
Dassel	47	—	45	45	48	46
Simpson	47	37	46	46	51	48
Swift	45	—	42	42	49	44
Hodgson 78	51	37	49	49	54	51
Sibley	52	—	49	51	55	52
Weber 84	51	39	48	52	54	51
Hardin	54	39	50	53	59	54
BSR 101	53 ²	41 ²	51 ²	51 ²	55 ²	52 ²
Vickery	52	—	50	51	55	52
Corsoy 79	49	37	46	47	56	50
Elgin 87 ³	48	—	47	47	51	48
Hack	55 ²	—	51 ²	55 ²	55 ²	53 ²
Hoyt	45	—	—	—	—	—
LSD 5%	2	2	3	3	3	2

¹1983-84 30-inch, 1985-87 10-inch. ²1985-87 data. ³Elgin 1983-86.

Table 33. Field characteristics of publicly developed soybean varieties, 1987

Variety	Mature		Lodging (score) ²	Height (inches)	Phytophthora (Gene)	Powdery mildew (reaction) ³	Chlorosis (score) ²
	mid-May Planting (days after August 31)	mid-June Planting					
Northern Zone (Crookston and Moorhead)							
Maple Ridge	0	—	1.4	24	S	S	3.0
Maple Isle	4	—	1.4	26	S	S	4.0
Maple Amber	4	—	1.6	26	Rps6	S	5.0
McCall	5	—	1.2	30	S	S	3.0
Chico	8	—	2.3	34	Rps1	R	3.0
Maple Arrow	14	—	2.0	30	Rps1	S	3.0
Ozzie	14	—	1.6	35	Rps1	S	2.0
Bicentennial	16	—	2.0	35	Rps6	S	4.0
Evans	16	—	2.8	37	Rps1	R	3.0
Glenwood ¹	16	—	2.3	33	Rps1	R	3.0
Maple Donovan	16	—	2.1	36	Rps6	S	4.0
Dawson	18	—	2.8	36	Rps1	S	2.0
Dassel ¹	22	—	2.3	30	Rps6	R	3.0
Simpson ¹	23	—	2.3	33	Rps1	S	4.0
Central Zone (Morris and Rosemount)							
McCall	—	—	2.0	36	S	S	3.0
Chico	6	—	2.5	34	Rps1	S	3.0
Ozzie	9	23	1.6	36	Rps1	S	2.0
Evans	12	24	2.5	41	Rps1	R	3.0
Glenwood	12	—	2.0	37	Rps1	R	3.0
Maple Donovan	13	—	3.0	40	Rps6	S	4.0
Dawson	14	27	2.4	38	Rps1	S	2.0
Dassel	16	—	1.6	34	Rps6	R	3.0
Simpson	18	—	2.5	38	Rps1	S	4.0
Swift	18	—	3.5	42	S	R	1.0
Hodgson 78	25	—	2.5	42	Rps1	S	3.0
Sibley	27	—	2.6	44	Rps1	S	4.0
Weber 84 ⁴	28	—	3.8	45	Rps1	R	2.0
Hardin ⁴	29	—	4.0	41	Rps1	S	4.0
Vickery ⁴	34	—	3.8	42	Rps1-c	S	4.0
Corsoy 79 ⁴	35	—	4.4	49	Rps1-c	S	4.0

Table 33 (continued). Field characteristics of publicly developed soybean varieties, 1987

Variety	Mature		Lodging (score) ²	Height (inches)	Phytophthora (Gene)	Powdery mildew (reaction) ³	Chlorosis (score) ²
	mid-May Planting (days after August 31)	mid-June Planting					
Southern Zone (Lamberton and Waseca)							
McCall	—	12	1.2	32	S	S	3.0
Ozzie	-2	20	1.6	34	Rps1	S	2.0
Evans	-1	20	2.5	38	Rps1	R	3.0
Glenwood	2	24	2.4	36	Rps1	R	3.0
Dawson	-1	23	2.1	38	Rps1	S	2.0
Dassel	2	24	1.8	34	Rps6	R	3.5
Simpson	3	24	2.5	38	Rps1	S	4.0
Swift	8	28	3.5	39	S	R	1.0
Hodgson 78	10	25	3.4	40	Rps1	S	3.0
Sibley	10	28	3.4	42	Rps1	S	4.0
Weber 84	15	30	3.8	45	Rps1	R	2.0
Hardin	15	29	4.0	41	Rps1	S	4.0
BSR 101	18	31	2.7	44	Rps1	R	3.0
Vickery	18	—	3.8	42	Rps1-c	S	4.0
Corsoy 79	22	32	4.4	49	Rps1-c	S	4.0
Elgin 87	25	34	3.2	45	Rps1-k	R	4.0
Hack	25	—	2.2	42	Rps1	S	4.0

¹Moorhead only. ²1 = excellent, 5 = very poor. ³R = resistant, S = susceptible. ⁴Not grown at Morris or Rosemount, shown here for comparative purposes only.

Table 34. Plant and seed characteristics of publicly developed soybean varieties, 1987.

Variety	Color			Seeds/pound (number)	Seed Quality (score) ⁵	Protein (percent) ⁶	Oil (percent) ⁶
	flower ²	pubescence ³	hilum ⁴				
Northern Zone (Crookston, Moorhead and Morris)							
Maple Ridge	P	T	Y	2686	1.3	40.3	19.1
Maple Isle	P	T	Br	2594	2.3	39.9	20.2
Maple Amber	P	T	Br	2594	1.7	40.4	21.8
McCall	P	G	Y	2837	1.3	38.4	18.7
Chico	W	G	Bf	3492	1.7	40.5	19.4
Maple Arrow	P	T	Br	2718	1.7	39.6	20.1
Ozzie	P	G	Y	2579	1.3	42.5	18.8
Bicentennial	P	T	Br	2414	1.7	41.7	19.9
Evans	W	G	Y	2892	1.3	40.9	18.7
Glenwood ¹	P	G	lb	2481	1.3	41.5	20.8
Maple Donovan	P	G	Bf	2892	1.3	39.8	20.5
Dawson	P	G	Y	2948	1.3	39.9	18.2
Simpson ¹	P	G	Bf	2987	1.3	36.4	20.8
Central Zone (Morris and Rosemount)							
McCall	P	G	Y	3242	2.4	38.5	19.2
Chico	W	G	Bf	3439	1.9	40.2	20.1
Ozzie	P	G	Y	2820	1.3	42.3	20.5
Evans	W	G	Y	2820	2.3	40.9	21.0
Glenwood	P	G	lb	2702	1.7	41.5	19.8
Dawson	P	G	Y	3131	1.3	39.9	20.1
Maple Donovan	P	G	Bf	2987	2.0	40.3	20.1
Simpson	P	G	Bf	2987	1.7	39.9	18.8
Dassel	P	G	Y	2670	2.7	41.0	20.5
Swift	W	T	Bl	2752	2.5	39.5	21.1
Hodgson 78	P	G	Bf	2670	3.0	40.5	21.0
Sibley	W	G	Y	2454	1.7	42.2	19.3
Weber 84 ⁷	W	T	Bl	3814	1.5	41.0	20.2
Hardin ⁷	P	G	Y	3290	1.7	40.5	21.5
Vickery ⁷	P	G	Y	3197	1.2	40.0	19.5
Corsoy 79 ⁷	P	G	Y	3414	1.5	39.7	19.6

Table 34 (continued). Plant and seed characteristics of publicly developed soybean varieties, 1987.

Variety	Color			Seeds/pound (number)	Seed Quality (score) ⁵	Protein (percent) ⁶	Oil (percent) ⁶
	flower ²	pubescence ³	hilum ⁴				
Southern Zone (Lamberton and Waseca)							
McCall	P	G	Y	3519	1.5	39.5	19.1
Ozzie	P	G	Y	2929	2.5	42.6	20.3
Evans	W	G	Y	3153	2.7	41.8	21.8
Glenwood	P	G	lb	2892	2.5	41.8	19.7
Dawson	P	G	Y	3290	2.5	41.0	19.9
Dassel	P	G	Y	2967	2.5	41.6	21.0
Simpson	P	G	Bf	3414	2.7	40.9	20.4
Swift	W	T	Bl	3290	2.7	39.5	21.1
Hodgson 78	P	G	Bf	3175	2.0	40.9	20.0
Sibley	W	G	Y	2609	2.4	42.1	20.4
Weber 84	W	T	Bl	3815	1.4	41.1	19.2
Hardin	P	G	Y	3290	1.7	40.9	19.0
BSR 101	P	G	lb	3068	1.4	40.3	19.2
Vickery	P	G	Y	3197	1.2	40.9	18.4
Corsoy 79	P	G	Y	3414	1.5	40.7	18.2
Elgin 87	P	T	Bl	3290	1.9	40.4	19.8
Hack	W	G	Bf	2948	1.3	40.6	19.1

¹Moorhead only. ²P=purple, W=white. ³T=tawny, G=gray. ⁴Y=yellow, G=gray, Br=brown, Bl=black, Bf=buff, lb=imperfect black. ⁵1=excellent, 5=very poor. ⁶Oven-dry. ⁷Not grown at Morris or Rosemount, shown here for comparative purposes only.

Table 35. Yields and characteristics of public and private soybean varieties, northern zone, 1987 (Crookston, Moorhead, Morris)

Brand or Originator	Variety	Mature (days after August 31)	Yield/acre (bushels)			Lodging (score) ²	Phytophthora Gene	Chlorosis (score) ²	Protein ³ %	Oil ³ %
			1985-87	1986-87	1987					
Agric. Canada	Maple Presto	-5	24	24	20	1.5	Rps1	4.0	39.4	22.0
Sigco	KG20	-3	36	38	34	1.5	S	2.0	40.7	17.8
Minn. A.E.S.	McCall	-1	36	37	32	1.1	S	3.0	38.4	18.7
Agric. Canada	Maple Ridge	-1	34	34	30	1.2	M	3.0	40.3	19.1
Agric. Canada	Maple Isle	4	32	32	30	1.2	M	4.0	39.9	20.2
Minn. A.E.S.	Chico	5	35	38	35	1.9	Rps1	3.0	40.5	19.4
Agric. Canada	Maple Amber	5	32	32	27	1.5	Rps6	5.0	40.4	21.8
Minn. A.E.S.	Clay	7	38	40	38	1.9	S	3.0	41.6	19.9
Jacques Seed Co.	011 ¹	10	—	42	39	1.8	S	3.0	40.9	18.3
SeedTec	390	11	—	36	37	2.0	S	3.0	40.6	17.5
Asgrow	A0358	11	—	—	36	1.9	Rps1	2.0	40.5	17.4
Interstate Seed	IS604	13	—	42	39	2.2	S	3.0	38.8	19.4
King Grain	KG30	13	38	40	34	1.8	S	3.0	40.8	20.2
Profiseed Inc.	PS 811	13	40	42	38	2.1	S	2.0	40.2	19.5
Minn. A.E.S.	Ozzie	13	40	40	39	1.4	Rps1	2.0	42.5	18.8
SeedTec	401	13	—	38	38	2.4	S	4.0	40.9	19.0
Dairyland	DSR-066	13	—	37	34	2.2	Rps6	4.0	40.2	18.7
Garst	8001	13	—	—	37	1.3	S	3.0	40.2	18.6
Ziller	Exp. 33	13	—	—	33	1.3	Rps1	5.0	40.2	19.6
Pioneer	9061	14	—	44	44	1.3	Rps1	4.0	38.7	17.3
SeedTec	350B ¹	14	—	40	38	1.8	S	3.0	39.2	20.3
University of Guelph	Bicentennial	14	37	39	37	1.7	Rps6	4.0	41.7	19.9
Jacques	8605	14	—	—	39	1.6	S	2.0	37.3	18.6
Agric. Canada	Maple Arrow	15	30	32	26	1.9	Rps6	3.0	39.6	20.1
Minn. A.E.S.	Evans	16	38	40	39	2.3	Rps1	3.0	42.1	18.7
Stine	0510	17	38	40	38	1.4	S	3.0	40.8	18.6
Interstate Seed	IS545	18	—	—	36	2.5	S	3.0	39.0	19.9
Minn. A.E.S.	Dawson	18	—	42	40	2.3	Rps1	2.0	39.9	18.2
Agric. Canada	Maple Donovan	19	—	42	37	2.0	Rps6	4.0	39.8	20.5
Agripro	AP120	20	—	36	35	2.0	Rps1	4.0	40.3	17.0
Interstate Seed	IS546	20	—	—	38	2.6	Rps1	2.0	42.8	17.1
Garst	8003	20	—	—	40	1.8	S	4.0	42.6	18.1
Northrup King	S 06-57	20	—	—	36	2.9	Rps1-c	2.0	40.0	17.7
King Grain	KG60	21	—	43	40	1.9	S	4.0	39.8	17.6
Garst	8002	24	—	—	37	1.8	S	2.0	39.6	19.1
Agripro	Ex1650	24	—	—	41	2.1	Rps1	3.0	39.5	17.4
LSD 5%			2	2	3					

¹Blend (information furnished by originator). ²1=excellent, 5=very poor. ³Oven-dry, Crookston data only.

Table 36. Yields and characteristics of public and private soybean varieties, central zone, 1987 (Becker, Morris, Rosemount)

Brand or Originator	Variety	Mature (days after August 31)	Yield/acre (bushels)			Lodging (score) ²	Phytophthora Gene	Chlorosis (score) ²	Protein ³ %	Oil ³ %
			1985-87	1986-87	1987					
CFS	060	7	—	—	41	2.7	S	2.0	39.9	20.8
Minn. A.E.S.	Ozzie	9	42	45	49	1.7	Rps1	2.0	42.3	20.5
Ziller	Exp. 33	11	—	42	44	2.2	Rps1	5.0	42.2	20.9
Minn. A.E.S.	Glenwood	12	—	—	51	2.3	Rps1	3.0	41.5	19.8
Minn. A.E.S.	Evans	12	42	46	49	2.8	Rps1	3.0	40.9	21.0
Interstate Seed	IS545	13	—	42	43	2.6	S	3.0	39.8	19.9
Minn. A.E.S.	Dawson	14	43	47	49	2.6	Rps1	2.0	39.9	20.1
Pioneer	9091	15	—	—	51	1.9	S	2.0	40.9	20.7
SeedTec	410B ¹	15	—	46	50	2.4	S	4.0	40.7	20.5
Jacques	8710	15	—	—	44	2.1	Rps1	4.0	42.5	19.3
Minn. A.E.S.	Dassel	16	—	46	48	1.9	Rps6	3.0	41.0	20.5
Agripro	AP120	17	39	41	42	2.9	Rps1	4.0	41.2	19.0
Thompson	EX 372	18	—	—	53	1.4	S	4.0	40.7	22.1
Midwest Oilseeds	EX0980	18	—	—	51	2.1	S	3.0	40.8	18.9
Northrup King	X 8707	18	—	—	50	2.4	S	2.0	39.7	21.4
Minn. A.E.S.	Simpson	18	44	47	49	2.6	Rps1	4.0	39.9	18.8
Northrup King	S 06-57	18	—	42	43	3.0	Rps1-c	2.0	41.0	19.2
Asgrow	A0949	19	—	46	50	2.7	Rps1-c	3.0	41.2	21.0
Sigco	80	19	40	44	46	2.8	Rps1	3.0	41.7	20.1
DeKalb	CX117	20	—	—	54	2.6	S	4.0	38.4	20.9
Stine	0560	20	—	—	51	3.0	Rps1	4.0	40.7	20.4
DeKalb	CX096	20	—	44	46	2.6	Rps1	3.0	41.6	21.1
Hofler	Garnet	21	—	45	50	2.8	Rps1-c	4.0	42.2	19.7
Interstate Seed	IS546	21	42	44	47	2.6	Rps1	2.0	41.6	20.1
Ziller	EXP43	22	—	—	53	2.3	Rps1-c	4.0	40.6	21.1
Pride	B095	22	42	46	47	2.8	S	4.0	40.6	20.6
Agripro	EX1650	23	—	—	50	2.3	Rps1	3.0	38.8	20.8
Dairyland	DSR-128	23	42	44	49	2.2	Rps1-c	3.0	40.0	20.8
Pride	B117	23	—	46	48	2.3	S	5.0	39.9	20.2
Kaltenberg	KB105	24	—	—	53	2.6	Rps1	4.0	40.8	20.8
Garst	8011	24	—	—	52	3.1	S	2.0	37.8	20.7
Profi Seed	PS1089	24	—	—	50	1.9	S	3.0	41.1	18.8
Ziller	EXP44	24	—	—	48	2.7	S	4.0	40.6	19.4
Dairyland	DSR-135	24	41	42	45	2.3	S	2.0	41.0	19.7
Midwest Oilseeds	EX1910-47	25	—	—	55	2.7	S	5.0	40.1	20.4
Interstate Seed	IS715	25	—	—	55	3.0	Rps1	5.0	40.4	20.1
Minn. A.E.S.	Hodgson 78	25	43	46	53	2.7	Rps1	3.0	40.5	21.0
Agripro	AP1776	25	45	49	52	1.6	Rps1	4.0	37.8	20.5
Northrup King	S 09-90	25	45	49	52	3.1	S	4.0	39.6	20.4
SOI	EXP. 21477 ¹	25	—	—	50	2.4	S	5.0	40.9	20.1
Asgrow	A1525	25	42	46	48	2.2	Rps1	4.0	40.8	19.7
Stine	1865 ¹	26	—	—	52	2.2	S	4.0	41.8	19.5
Stine	EX1910-27	26	—	—	52	2.4	S	5.0	41.8	20.1
Midwest Oilseeds	1820	26	—	48	49	2.1	S	4.0	41.7	19.3
Seedtec	610	26	—	46	49	2.9	S	5.0	40.3	21.4
Pride	B152	26	44	47	49	2.4	Rps1-c	4.0	37.7	20.2
SOI	174 ¹	26	—	—	49	2.6	M ⁴	4.0	39.5	19.9
Jacques	J-150	26	—	—	48	2.4	Rps1	3.0	40.4	20.6
Thompson	T-18	27	—	48	52	2.7	S	5.0	40.8	20.3
CFS	158	27	—	—	52	2.0	S	2.0	40.1	19.6
Hy-Vigor	EXROW99	27	—	—	51	2.4	M ⁴	2.0	39.3	19.2
Northrup King	S 14-60	27	45	48	51	2.6	S	3.0	41.2	19.2
SOI	166	27	—	47	50	2.3	S	4.0	40.2	19.3
Minn. A.E.S.	Sibley	27	—	46	49	2.9	Rps1	4.0	42.2	19.3
Garst	8010	27	—	—	47	3.1	S	3.0	40.7	20.4
Sexauer	SX 1020	27	—	41	45	3.1	Rps1	4.0	38.8	19.0
SeedTec	620B ¹	28	—	48	52	2.9	S	5.0	39.5	20.3
Hofler	Sapphire	28	—	—	51	2.4	Rps1-c	3.0	37.4	19.1
DeKalb	CX187	28	—	—	50	2.0	S	4.0	39.4	19.8
Funk	G3197	29	47	50	52	2.1	S	3.0	39.6	19.6
Kruger	KB140 ¹	29	—	—	52	2.3	S	4.0	40.4	20.1
Hy-Vigor	K-R9 ¹	29	—	—	52	2.7	Rps1	4.0	40.4	20.3
Mustang	1180A ¹	29	—	—	51	2.6	Rps1	4.0	38.7	20.3
Golden Harvest	X170 ¹	29	—	—	51	2.6	S	4.0	39.1	20.0
Interstate Seed	IS622	30	—	—	56	2.6	S	4.0	38.8	18.0
Hofler	Jade	30	—	45	48	2.9	S	3.0	40.6	20.2
King Grain	KG81	31	—	42	46	2.3	Rps1	2.0	38.5	19.8
Mustang	1280 ¹	33	—	44	43	2.6	M ⁴	4.0	40.4	19.2
Sexauer	80-61830	34	—	—	51	3.2	Rps1	4.0	40.9	18.8
LSD (5%)			2	3	5					

¹Blend (information furnished by originator). ²1 = excellent, 5 = very poor. ³Oven-dry, Rosemount data only. ⁴Mixture of Rps1 and susceptible.

Table 37. Yields and characteristics of public and private soybean varieties, southern zone, 1987 (Fairmont, Lambertson, Waseca)

Brand or Originator	Variety	Mature (days after August 31)	yield/acre (bushels)			Lodging (score) ²	Phytophthora Gene	Chlorosis (score) ²	Protein ⁵ %	Oil ⁵ %
			1985-87	1986-87	1987					
Agripro	AP1776	11	—	58	53	1.3	Rps1	4.0	39.2	20.8
Minn. A.E.S.	Sibley	11	—	50	51	3.6	Rps1	4.0	41.0	21.6
Latham	EX 220	11	—	—	50	3.0	Rps1	3.0	40.3	21.8
Minn. A.E.S.	Hodgson 78	11	48	51	47	3.0	Rps1	3.0	40.6	22.0
Profi Seed	PS1181	11	—	—	46	1.8	S	3.0	41.2	21.5
Sexauer	SX 1020	11	—	45	42	3.2	Rps1	4.0	40.8	20.0
Iowa A.E.S.	Hardin	12	52	57	52	3.4	Rps1	4.0	40.5	21.5
Thompson	T-11	12	—	—	52	2.0	S	3.0	40.7	20.5
S Brand	S-38A	12	—	55	50	1.6	S	4.0	40.2	19.4
Rossbach Seed Farm	Lakeside 101 ¹	12	—	52	49	3.3	M ³	3.0	41.1	20.8
Custom Farm Seed	CFS 158	12	—	—	48	1.6	S	4.0	40.2	19.2
Diamond	D140B ¹	12	47	50	47	3.8	M ³	3.0	40.8	20.5
Midwest Oilseeds	EX1910-47	13	—	—	54	2.3	S	5.0	42.2	21.2
Jacques	86158	13	—	—	52	1.6	S	4.0	40.2	19.5
Sigco	92	13	—	—	52	2.1	S	4.0	40.8	18.3
Kaltenberg	KB116	13	—	55	52	1.8	S	3.0	40.2	19.1
Tilney Farms	TF EXP 168	13	—	—	52	2.2	S	4.0	41.5	20.4
Stine	1865 ¹	13	—	—	51	2.0	S	4.0	41.2	20.7
Latham	200B ¹	13	—	—	51	1.7	S	3.0	39.6	19.8
Ziller	BT 2650	13	—	56	51	2.0	S	4.0	41.2	20.7
Ehrich	E-86	13	—	54	50	1.7	S	3.0	40.9	19.8
GFS	206	13	—	—	50	1.8	S	3.0	40.7	19.8
Asgrow	A1937	13	49	54	49	2.6	Rps1	4.0	40.1	21.2
NC+	X181	13	—	—	49	1.9	S	3.0	40.0	19.3
Midwest Oilseeds	1480	13	50	54	49	2.2	S	4.0	41.1	20.6
Agripro	EX 1989	13	—	—	49	3.1	Rps1-c	3.0	38.5	18.9
Farmacy	Challenge	13	—	—	48	1.7	S	2.0	40.5	19.7
Interstate Seed	IS622	13	—	54	48	1.7	S	4.0	40.2	20.3
Terra	Runner III + ¹	13	—	—	47	1.8	M ³	4.0	39.6	20.2
SOI	EXP 31387	13	—	—	44	2.4	Rps1-c	4.0	40.7	20.8
Farmacy	EXP63	13	—	—	42	2.0	Rps1-c	4.0	40.5	20.3
Jacques	86018	14	—	—	54	2.4	Rps1-c	2.0	40.2	20.4
Mustang	1150	14	—	—	53	2.0	S	3.0	40.4	20.1
SOI	EXP 24147	14	—	—	52	2.4	S	5.0	42.5	19.6
Ziller	BT 2290	14	—	53	52	2.4	S	4.0	40.9	20.7
Hy-Vigor	EX.ROW 99	14	—	—	51	1.7	M ³	3.0	40.6	20.5
Pride	B152	14	—	54	51	1.6	Rps1-c	4.0	39.6	20.8
Lynks	LX 8165	14	—	54	51	1.7	M	4.0	40.1	19.1
Kruger	K1012	14	—	56	50	1.7	S	3.0	40.1	19.2
GFS	107 ¹	14	—	—	49	2.6	M ³	3.0	40.2	19.7
DeSoy	302-11 ¹	14	—	54	49	1.9	Rps1	2.0	40.8	19.9
Funk	G3197	14	—	54	48	1.3	S	3.0	40.6	19.5
Pioneer	9181	14	—	—	47	2.3	Rps1-c	4.0	40.8	20.4
Jacques	J-201	14	—	48	45	2.3	Rps1	4.0	41.7	20.2
Dairyland	DSR-155	14	—	—	42	1.9	Rps1-c	4.0	40.8	20.9
Stine	EX 1910-27	15	—	—	54	2.3	S	5.0	43.6	19.6
Northrup King	S 14-60	15	51	55	52	2.3	S	3.0	40.2	19.0
Diamond	D150	15	—	—	51	1.9	S	4.0	39.6	19.6
Golden Harvest	X170 ¹	15	—	56	51	2.0	S	4.0	39.7	20.7
Mustang	1180A ¹	15	—	—	50	2.7	Rps1	4.0	40.3	19.7
Wilson Blend®	1880 ¹	15	—	—	50	2.4	M ³	4.0	40.8	19.5
Profi Seed	PS2198	15	—	—	50	1.4	S	4.0	39.7	18.9
SeedTec	630	15	—	52	49	3.3	S	3.0	40.6	20.2
S Brand	S-39B ¹	15	—	—	49	1.6	S	4.0	39.8	20.4
Hoffman	8701 ¹	15	—	—	48	1.6	S	4.0	40.7	19.1
Tilney Farms	TF1871	15	—	—	48	2.0	S	4.0	40.4	20.3
DeKalb	CX187	15	—	—	48	1.6	S	4.0	41.2	20.5
Thompson	EX 416	15	—	—	47	1.9	S	2.0	40.8	20.2
Profi Seed	PS1189	15	—	—	44	2.0	S	4.0	40.3	20.4
Garst	8101	15	—	—	40	2.1	S	4.0	40.1	20.8
Asgrow	A2234	16	—	—	50	1.2	Rps1-k	3.0	40.4	20.0
DeSoy	333R ¹	16	—	—	50	2.2	Rps1	3.0	40.7	19.6
Pride	X720	16	—	—	50	1.7	Rps3	4.0	41.2	22.1
Terra	Runner + ¹	16	—	—	50	2.9	Rps1	4.0	40.2	20.1
Iowa A.E.S.	Weber 84	16	49	52	49	3.7	Rps1	3.0	41.0	20.2
GFS	105	16	—	51	47	3.4	Rps1	4.0	40.4	20.7
Hy-Vigor	K-R9 ¹	16	—	—	47	2.9	Rps1	4.0	40.4	20.5
Latham	301 ¹	16	47	48	45	3.0	Rps1	3.0	40.7	20.8
NC+	IH53	16	—	—	45	2.9	S	5.0	41.2	19.9
Kruger	KB153 ¹	16	—	—	45	2.2	Rps1	3.0	39.7	19.2
Pioneer	9202	17	—	—	51	1.8	S	4.0	39.6	19.0
Rossbach Seed Farms	Lakeside 104 ¹	17	50	53	50	3.7	M ³	4.0	40.6	19.6
Midwest Oilseeds	2500 ¹	17	—	54	50	2.3	M ³	3.0	40.3	21.0
NC+	IK98	17	—	—	49	3.4	Rps1	3.0	40.3	20.0

Table 37. (continued). Yields and characteristics of public and private soybean varieties, southern zone, 1987 (Fairmont, Lambertson, Waseca)

Brand or Originator	Variety	Mature (days after August 31)	yield/acre (bushels)			Lodging (score) ²	Phytophthora Gene	Chlorosis (score) ²	Protein ⁵ %	Oil ⁵ %
			1985-87	1986-87	1987					
Rossbach Seed Farms	Lakeside 106 ¹	17	—	—	49	3.3	Rps1	3.0	40.4	21.4
Interstate Seed	IS624	17	—	—	48	3.0	Rps1	4.0	39.6	20.8
Garst	8201	17	—	—	47	2.3	S	3.0	38.9	19.3
Ziller	EXP.45	17	—	—	46	1.6	Rps1	4.0	41.8	19.8
Thompson	T-12	18	51	56	56	3.7	S	5.0	41.3	21.2
Iowa A.E.S.	Vickery	18	49	54	54	3.7	Rps1-c	4.0	40.0	19.5
Thompson	EX 366	18	—	—	51	3.0	S	4.0	39.9	20.4
Stine	EX1980	18	—	—	50	2.0	M ³	4.0	40.9	20.4
SRF	EXP 20137 ¹	18	—	—	50	3.1	Rps1	3.0	40.5	20.5
Northrup King	S 15-50	18	49	54	50	2.9	Rps1-c	4.0	40.9	20.4
Golden Harvest	H-1198 ¹	18	50	54	50	3.2	S	4.0	40.4	20.0
Farmacy	Abel	18	—	52	49	3.3	Rps1	4.0	39.4	19.4
Jacques	J-231	18	50	52	47	2.8	Rps1	3.0	40.9	20.9
Agripro	AP2021	18	—	—	46	2.4	Rps1	4.0	40.2	19.9
Iowa A.E.S.	BSR 101	18	48	50	45	2.4	Rps1	3.0	39.2	19.4
Northrup King	S 23-12	18	—	51	45	1.3	S	4.0	39.5	21.0
S Brand	S-39A	18	—	—	44	1.9	S	3.0	40.2	19.5
SOI	276 ¹	19	—	—	52	2.3	M ³	5.0	40.2	21.5
Wilson Blend [®]	2145 ¹	19	—	52	50	2.9	M ³	4.0	39.5	20.0
Midwest Oilseeds	EX2910	19	—	—	50	2.7	S	4.0	39.6	19.3
Hy-Vigor	EX D-159	19	—	—	49	3.6	M ³	4.0	40.6	18.7
Diamond	D195B ¹	19	—	51	49	2.2	M ³	3.0	40.7	20.8
Willette Seed Farm	Prescott 108 ¹	19	—	52	48	2.8	M ⁴	4.0	39.8	20.1
Tilney Farms	TF1972	19	—	—	47	3.3	Rps1	4.0	39.8	20.8
Hofler	Jewell	19	—	50	46	2.0	Rps1	4.0	40.9	18.8
Hofler	Pearl	19	—	44	37	2.3	Rps1-c	4.0	41.4	20.6
Dairyland	DSR-252	20	—	—	50	1.9	S	3.0	41.4	20.8
Latham	401 ¹	20	—	52	49	3.2	S	3.0	39.5	18.5
Pride	B203	20	48	51	48	3.0	Rps1-c	5.0	40.7	19.3
Asgrow	A2187	20	48	53	48	1.7	Rps1	3.0	40.5	20.1
Latham	EX 520	20	—	—	47	2.0	Rps1-c	4.0	41.0	19.6
SRF	EXP 10267 ¹	20	—	—	47	2.7	M ⁴	5.0	40.8	20.9
GFS	423	20	—	48	44	2.2	Rps1	3.0	40.2	18.2
Thompson	T-30P ¹	21	52	56	55	3.2	S	4.0	39.6	20.1
Terra	TB231B ¹	21	—	—	54	3.1	M ³	2.0	40.7	21.0
Illinois A.E.S.	Corsoy 79	21	48	52	52	4.0	Rps1-c	4.0	39.7	19.6
Lynks Seeds	LX 8202	21	49	54	52	2.7	Rps1	4.0	41.3	18.6
SeedTec	701	21	—	53	51	3.7	S	5.0	40.8	18.8
Dairyland	DSR-204	21	—	—	50	2.2	Rps1-c	3.0	39.6	19.1
S-Brand	S-40D	21	—	—	50	2.7	S	5.0	40.0	19.9
Illinois A.E.S.	Hack	21	50	52	49	2.0	Rps1	4.0	39.0	20.2
Profi Seed	PS1152	22	50	56	54	3.2	S	3.0	40.0	21.7
Latham	650	22	51	54	53	2.9	S	3.0	41.2	20.2
SOI	267	22	49	54	52	2.7	Rps3	4.0	42.3	20.3
Sexauer	SX109OA	22	—	—	50	3.2	Rps1	4.0	41.5	20.3
Northrup King	S 23-03	22	50	54	50	2.9	S	3.0	41.2	19.5
Farmacy	Astro ¹	22	—	—	46	3.0	M ³	4.0	40.0	19.8
DeKalb	CX264	23	—	54	53	2.9	S	3.0	41.2	21.6
Thompson	T-25C ¹	23	—	—	51	3.1	S	3.0	39.9	21.0
DeKalb	CX226	23	—	52	50	2.3	S	5.0	39.6	19.4
Sexauer	SX2080	23	—	—	49	2.1	Rps1	4.0	41.3	20.1
Stine	2825 ¹	23	—	—	49	2.8	M ³	4.0	39.7	20.6
Mustang	1280 ¹	23	—	53	49	2.7	M ³	4.0	40.7	20.1
CFS	220	23	—	—	47	2.2	Rps1	3.0	41.6	19.9
Pride	B236	23	47	50	45	2.3	Rps1	5.0	38.1	19.5
DeKalb	CX174	23	45	49	44	2.4	S	2.0	39.7	19.3
Indiana A.E.S.	Century 84	23	—	44	37	1.6	Rps1-k	3.0	42.6	19.2
Hoffman	8301 ¹	24	—	—	53	2.9	S	2.0	38.9	20.6
Hoffman	8702 ¹	24	—	—	50	2.3	M ³	4.0	39.6	20.0
Kaltenberg	KB231	24	49	51	48	3.3	S	4.0	40.2	19.9
Iowa A.E.S.	BSR 201	24	48	50	47	3.6	Rps1	5.0	41.2	21.0
Dairyland	DSR-171	24	46	48	42	2.4	S	4.0	40.0	19.4
Indiana A.E.S.	Keller	24	—	42	37	2.9	Rps1-c + 3	4.0	41.8	19.0
Ohio A.E.S.	Hoyt	25	—	54	51	1.7	Rps1	4.0	39.8	19.5
SRF	220P	25	—	50	47	3.1	Rps1	5.0	41.1	19.6
Iowa A.E.S.	Elgin	25	43	43	46	3.1	S	4.0	38.1	18.7
Garst	8202	25	—	—	41	2.1	S	3.0	39.1	19.4
Sexauer	SX80-62098	26	—	—	47	3.2	Rps1	5.0	40.2	20.8
Garst	8205	29	—	—	41	2.0	S	4.0	39.3	19.2
Garst	8203	31	—	—	38	2.2	S	4.0	40.7	19.6
LSD 5%			2	3	5					

¹Blend (information supplied by originator). ²1=excellent, 5=very poor. ³Mixture of Rps1 and susceptible. ⁴Mixture of Rps1 and Rps1-c. ⁵Oven-dry, Waseca data only.

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 trials were 30 inches. Plant populations averaged 20,000 for oilseed and 15,000 for nonoilseed.

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.

Companies enter hybrids in trials volun-

tarily. Testing is usually for 3 years.

Yield and oil percentage data of all varieties are based on seed of 10 percent moisture. 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;

Cargill Seed Division, Box 5645, Minneapolis, MN 55440;

Cenex/Land O'Lakes, P.O. 1291, Minot, ND 58702;

Contiseed, P.O. Box 1296, Huron, SD 57350;

Dahlgren and Company, Inc., Box 609, Crookston, MN 56716;

Interstate Seed and Grain Company, Box 470, Fargo, ND 58107;

Jacques Seed Co., Prescott, WI 54021;

Keltgen Seed Company, Box A, Olivia, MN 56277;

Northrup King Co., 1500 NE Jackson St., Minneapolis, MN 55413;

Pioneer HiBred International Inc., Box 163, Moorhead, MN 56560;

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.



Many high yielding varieties of sunflower have been tested at various locations in Minnesota, providing performance data to aid grower decisions.

Table 38. Yields of sunflower varieties 1987.

Variety and company	Morris/ Rosemount				Morris 1984-5,87	Lamberton 1984-85	Rosemount 1984,87	Average of four locations
	Morris 1987	Rosemount 1987	Average 1987	Crookston 1984-85				
----- lbs/a -----								
Oilseed types								
206, Cargill	—	—	—	1897	1838 ²	2118	2371 ¹	2011
207, Cargill	1781	2384	2083	2539	2239	1990	2553	2320
208, Cargill	—	—	—	1838	1661 ²	1537	1350 ¹	1632
SF 100, Cargill	1360	1681	1521	1835	1679	1862	1511	1717
Hysun 354, Contiseed	1510	1327	1419	—	1510 ¹	—	1327 ¹	1419 ¹
Hysun 33, Contiseed	1355	1409	1382	—	1355 ¹	—	1409 ¹	1382 ¹
DO-705, Dahlgren	2046	1616	1831	1763	1701	1940	2188	1876
DO-730, Dahlgren	2006	1605	1806	2262	1768	1611	2207	1940
DO-855, Dahlgren	1947	1882	1915	1676	2150	1714	2039	1923
Cenex 8101, Interstate	—	—	—	2180	2238 ²	1835	2338 ¹	2121
IS 3001, Interstate	—	—	—	2149	1836 ²	1901	2114 ¹	1984
IS 3007, Interstate	1440	1532	1486	—	1440 ¹	—	1532 ¹	1486 ¹
IS 7111, Interstate	1848	1569	1709	1806	1817	2047	1835	1870
Capri, Jacques	2422	1863	2143	—	2422 ¹	—	1863 ¹	2143 ¹
Challenger, Jacques	—	—	—	1825	1577 ²	1832	2083 ¹	1793
Columbia II, Jacques	1851	1602	1727	1872 ¹	1893 ¹	2350 ¹	2106 ²	2037
Zenith, Jacques	1631	1557	1594	—	1631 ¹	—	1557 ¹	1594
KO-66, Keltgen	1911	2043	1977	2026	1820	1431	2292	1884
KO-70, Keltgen	1951	1511	1731	—	1951 ¹	—	1511 ¹	1731 ¹
6440, Pioneer	2027	1569	1798	—	2027 ¹	—	1569 ¹	1798 ¹
Sunbred 285, Northrup King	—	—	—	2308	2268 ²	1930	2257 ¹	2181
Sunbred 277, Northrup King	1427	1151	1289	—	1427 ¹	—	1151 ¹	1289 ¹
Sunbred 281, Northrup King	1087	1492	1290	—	1087 ¹	—	1492 ¹	1290 ¹
Sunbred 256, Northrup King	2236	1835	2036	—	2236 ¹	—	1835 ¹	2036 ¹
SF316, Seedtec Int'l	1574	1334	1454	2196	2077	1894	1696	1978
SF317, Seedtec Int'l	1380	1519	1450	2009	1895	1556	1569	1773
SFDG-2 (#29), Seedtec Int'l	1198	1703	1451	—	1198 ¹	—	1703 ¹	1451 ¹
Sunwheat, Seedtec Int'l	1343	2559	2271	—	1343 ¹	—	3199 ¹	2271 ¹
Seedtec 634, Seedtec Int'l	—	—	—	2220	2286 ²	1784	1858 ¹	2062
SIGCO 456, Sigco Research	—	—	—	2299	2285 ²	1791	2632 ¹	2197
SIGCO 465A, Sigco Research	1893	1874	1884	2214 ¹	1751 ²	2399 ¹	1788 ¹	1949
SIGCO 468, Sigco Research	1648	1910	1779	1935	1827	1733	1434	1743
SIGCO 475, Sigco Research	2026	1871	1949	2262 ¹	2158 ²	2105 ¹	2023 ¹	2121
Sokota 5000, Sokota Hybrid	—	—	—	1914 ¹	2265 ¹	2306 ¹	—	2162 ¹
Sokota 2057, Sokota Hybrid	1946	1980	1963	1669	1882	2029	2303	1961
Sokota 3900, Sokota Hybrid	1151	1109	1130	—	1151 ¹	—	1109 ¹	1130 ¹
Sokota 5600, Sokota Hybrid	1808	1586	1697	—	1808 ¹	—	1586 ¹	1697 ¹
1424, Stauffer	—	—	—	1896 ¹	1894 ¹	2651 ¹	2013 ²	2114
S1296, Stauffer	2269	1875	2072	1918 ¹	2398 ²	2637 ¹	2241 ¹	2306
S1300, Stauffer	1669	1904	1787	1634	1593	2262	1904 ¹	1809
S-1888, Stauffer Seeds	1595	1429	1512	1850	1934	1909	1807	1881
Nonoilseed varieties								
83-004, Agway	2126	2348	2237	—	2126 ¹	—	2348 ¹	2237 ¹
Royal Hybrid 2141, Agway	2644	1575	2110	2468	2547	1872	2263	2316
D131, Dahlgren	2624	1908	2266	2053	2683	1534	1949	2125
D141, Dahlgren	1417	1653	1535	2029 ¹	1456 ²	2598 ¹	2001 ¹	1924
SIGCO 954, Sigco Research	2561	1851	2206	1909	2560	1652	2436	2186
SIGCO 964, Sigco Research	1965	1729	1847	2046	2151	1749	1966	1997
SIGCO 974, Sigco Research	1849	1868	1859	—	1849 ¹	—	1868 ¹	1859 ¹
LSD (P=0.05)	641.5	389.0	515.3	260.6	376.5	322.1	379.6	75.2

¹One year data. ²Two year data.

Table 39. Characteristics of oilseed sunflower varieties.

Variety and company	Oil ¹	Seeds/ pound ²	Planting to		Lodging ⁵	Height ⁶	Head moisture ³
			bloom ³	maturity ⁴			
	%	no.	days		%	inches	%
206, Cargill	44	9,450	74	122	12	68	46
207, Cargill	40	8,236	73	122	8	55	43
208, Cargill	40	10,800	75	122	8	55	53
SF100, Cargill	39 ⁸	8,240 ⁷	76 ⁷	—	0 ⁷	66 ⁷	—
Hysun 354, Contiseed	47 ⁸	7,536 ⁷	78 ⁷	—	3 ⁷	76 ⁷	—
Hysun 33, Contiseed	46 ⁸	8,576 ⁷	78 ⁷	—	9 ⁷	82 ⁷	—
DO 705, Dahlgren	43	8,449	71	120	15	67	49
DO 730, Dahlgren	46	9,068	74	124	5	76	51
DO 855, Dahlgren	43	8,222	71	121	9	67	50
Cx 8101, Cenex/Land O'Lake	45	8,100	74	124	12	66	49
IS 3001, Interstate	45	9,260	74	123	6	64	48
IS 3007, Interstate	48 ⁸	6,020 ⁷	72 ⁷	—	4 ⁷	76 ⁷	—
IS 7111, Interstate	45	8,095	71	122	9	66	47
Capri, Jacques	48 ⁸	7,868 ⁷	73 ⁷	—	10 ⁷	68 ⁷	—
Challenger, Jacques	43	10,310	70	122	9	63	49
Columbia II, Jacques	44	10,109	71	124	9	65	49
KO-66, Keltgen	41	8,372	72	123	15	72	59
K070, Keltgen	49 ⁸	7,824 ⁷	74 ⁷	—	30 ⁷	79 ⁷	—
6440, Pioneer	49 ⁸	8,432 ⁷	75 ⁷	—	1 ⁷	75 ⁷	—
Sunbred 277, Northrup King	45 ⁸	9,196 ⁷	75 ⁷	—	28 ⁷	77 ⁷	—
Sunbred 281, Northrup King	49 ⁸	10,304 ⁷	75 ⁷	—	4 ⁷	75 ⁷	—
Sunbred 285, Northrup King	43	8,890	76	124	18	68	54
Sunking 256, Northrup King	46 ⁸	8,264 ⁷	77 ⁷	—	4 ⁷	67 ⁷	—
S316, Seedtec Int'l.	43	8,560	75	123	14	68	52
S317, Seedtec Int'l.	44	8,400	75	125	13	69	61
SFDG-2, Seedtec Int'l.	47 ⁸	7,272 ⁷	75 ⁷	—	7 ⁷	70 ⁷	—
634 Brand, Seedtec Int'l.	43	9,450	75	125	9	67	54
Sunwheat, Seedtec Int'l.	42 ⁸	10,024 ⁷	65 ⁷	—	14 ⁷	46 ⁷	—
SIGCO 456, Sigco Research	40	8,890	76	125	17	77	58
SIGCO 465A, Sigco Research	47 ⁸	8,380 ⁷	73 ⁷	—	7 ⁷	72 ⁷	—
SIGCO 468, Sigco Research	46	9,501	75	125	9	70	55
SIGCO 475, Sigco Research	42	9,227	77	124	16	71	65
Sokota 2057, Sokota Seeds	41	9,169	71	120	9	68	45
Sokota 3900, Sokota Seeds	48 ⁸	9,068 ⁷	73 ⁷	—	4 ⁷	72 ⁷	—
Sokota 5000, Sokota Seeds	42	10,800	74	122	12	67	50
Sokota 5600, Sokota Seeds	49 ⁸	7,296 ⁷	74 ⁷	—	4 ⁷	74 ⁷	—
S-1296, Stauffer Seeds	46 ⁸	8,562 ⁷	69 ⁷	—	14 ⁷	64 ⁷	—
S-1300, Stauffer Seeds	41	10,913	72	119	9	59	36
S-1424, Stauffer Seeds	—	8,890 ⁷	72 ⁷	123 ⁷	10 ⁷	68 ⁷	—
S-1888, Stauffer Seeds	42	9,897	73	122	11	68	49

¹10 percent moisture basis, 19 year/location average; ²5 year/location average; ³12 year/location average; ⁴4 year/location average; ⁵down or broken stalks, 10 year/location average; ⁶13 year/location average; ⁷2 year/location average; ⁸1 year/location.

Table 40. Characteristics of nonoilseed sunflower varieties

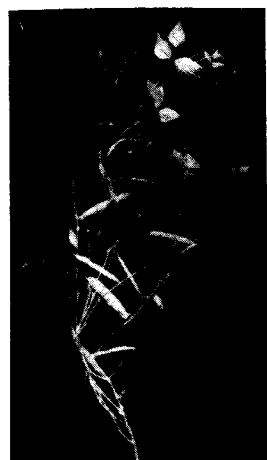
Variety and company	Large seed ¹	Test weight/ bushel	Seeds/ pound	Planting to		Lodging ³	Height	Head moisture ⁴	Seed moisture ⁵
				bloom	mature ²				
	%	lbs.	no.	days		%	inches	%	
83-004 Agway	—	29 ⁵	3864 ⁵	73 ⁵	—	4 ⁵	77 ⁵	—	
Royal Hybrid 2141, Agway	33	28 ⁶	4039 ⁶	72 ⁶	124	4 ⁴	69	62	
D 131, Dahlgren	29	27 ⁶	4840 ⁶	73 ⁶	123	8 ⁴	69	62	
D 141, Dahlgren	28	26 ⁶	4405 ⁶	74 ⁶	123	7 ⁴	63	59	
SIGCO 954, Sigco Research	46	25 ⁶	3454 ⁶	71 ⁶	123	9 ⁴	65	60	
SIGCO 964, Sigco Research	36	26 ⁶	4014 ⁶	70 ⁶	121	6 ⁴	62	48	
SIGCO 974, Sigco Research	—	24 ⁵	3148 ⁵	72 ⁵	—	4 ⁵	77	—	

¹Held on a 20/64 round-hole sieve (9 year/location average); ²4 year/location average; ³Down or broken stalks; ⁴14 year/location average;

⁵Two year/location average; ⁶11 year/location average.

Fieldbean

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 dries 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 dis-

ease 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.

FIELD BEAN

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

There are more than 15 market classes of dry, edible bean, but only nine have been grown commercially in Minnesota. 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 NAVY VARIETIES

Bunsi—Medium yield. Late. Erect vine. Medium size, navy seed. Released by Colombian Agriculture Institute. Rereleased by Agricultural Experiment Station in 1982. Variety protection pending.

C-20—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.

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

Harofleet—High yield. Late. Medium size bush. Small, navy seed. Developed by

Agriculture Canada, Harrow and University of Guelph. Licensed in 1983.

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

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

Snow-Bunting—Medium yield. Early. Medium size bush. Medium size, navy seed. Released by Clarence Muehlfield, Bridgeport, MI 48722 in 1974. Distributed by Agri sales inc., Olivia, MN 56277.

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

Up-Land—Medium yield. Medium maturity. Medium size bush. Medium size, navy seed. Released by Clarence Muehlfield, Bridgeport, MI 48722 in 1974. Distributed by Agri sales inc., Olivia, MN 56277.

RECOMMENDED PINTO VARIETIES

Fiesta—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.

VARIETIES

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.

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

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

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

RECOMMENDED KIDNEY VARIETIES

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

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

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

RECOMMENDED GREAT NORTHERN AND SMALL WHITE VARIETIES

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

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

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.

RECOMMENDED PINK AND SMALL RED VARIETIES

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.

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.*

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.

RECOMMENDED BLACK TURTLE SOUP VARIETIES

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

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.

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.

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

NAVY VARIETIES NOT ADEQUATELY TESTED

Agri-1—High yield. Early maturity. Bush. Medium seed. Developed by Gentec Seeds, Ltd.

Crestwood—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—Medium yield. Late. Erect vine. Large seed. Released by University of Guelph, Ontario, Canada. Licensed in 1980.

Hyden—High yield. Late. Vine. Medium 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.

Pearl—High yield. Medium maturity. Vine. Medium seed. Developed by Gentec Seeds, Ltd.

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

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

PINTO VARIETIES NOT ADEQUATELY TESTED

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

UI-129—High yield. Late. Large, pros-



High yielding varieties of field beans, such as this Swedish Brown type, are being tested for yield and adaptability to Minnesota conditions.

Table 41. Characteristics of fieldbean varieties

Class and variety	Seed yield				Average - 4 locations			
	Crookston 1982-5,87	Morris 1982-5,87	Lamberton 1982-5,87	Becker ¹ 1982-4,87	Yield/acre	Seeds/ pound	Planting to maturity	Growth habit ²
	-----lbs/a-----					number	days	
Pinto								
Fiesta	2259 ⁶	1824 ⁶	1434 ⁶	2484 ⁶	1968	1080	97	V
Gala	2267 ⁶	2007 ⁶	1351 ⁶	2595 ⁶	2019	1160	99	V
Nodak	2295	2158	1286	2718	2082	1359	95	V
Pindak	1832	1870	1456	2574	1899	1634	99	V
UI-126	1564 ⁵	2150 ⁵	1676 ⁵	2765 ³	1935	1328	102	V
UI-129	1863 ⁵	2110 ⁵	1734 ⁵	2732 ³	2021	1368	104	V
Wyo 167	2038 ⁵	2164 ⁵	1349 ⁵	2495 ⁴	1973	1258	106	V
Othello	2315 ³	2235 ³	1227 ³	3056 ³	2208	1465	99	V
Navy								
Bunsi	2153	1939	1172	2317	1895	2545	102	ESV
C-20	1839	2269	1430	2362	1955	2339	104	ESV
Fleetwood	1880	1928	1430	2362	1876	2628	102	B
Harofleet	1983	1846	1383	2591	1917	2585	103	B
OAC Seaforth	1374	1668	1270	1934	1542	2469	94	B
Seafarer	1602	1729	1240	1819	1586	2516	93	B
Snow-Bunting	1840	2020	1271	1978	1767	2344	94	B
Snow-Flake	1862 ⁵	1739 ⁵	1294 ⁵	2044 ⁵	1704	2293	91	B
Up-Land	1630	2009	1386	2237	1793	2469	87	B
Crestwood	1942	2147	1301	2412	1951	2287	93	B
Ex Rico 23	1369 ⁶	2092 ⁶	1370 ⁶	2225 ⁶	1740	2170	103	ESV
Hyden	2321 ⁵	2055	994 ⁵	2974 ³	1932	2611	87	V
Midland	1854	1773	1267	1806	1675	2929	99	B
Sunrise	2225	2076	1287	2674	2066	2189	94	B
Wesland	1942	1906	1358	2146	1838	2582	92	B
Pearl	2812 ³	2145 ³	948 ³	2802 ³	2177	2389	93	V
Agri-1	2579 ³	1953 ³	1168 ³	2529 ³	2057	2389	87	B
Small White								
Aurora	2046 ⁶	2027 ⁶	1396 ⁶	2246 ⁶	1912	3020	107	ESV
UI-158	2303	1862	1225	3243	2101	2742	99	ESV
Great Northern								
Emerson	2340 ⁶	2063 ⁶	1581 ⁶	2614 ⁵	2150	990	100	V
UI-425	2139 ⁶	2278 ⁶	1741 ⁶	2647 ⁵	2201	1250	103	SV
Spinel ¹³	1493 ⁶	2383 ⁶	1796 ⁶	1862 ⁵	1884	1260	104	B
Small Red								
UI-37	1658 ⁶	1376 ⁶	957 ⁶	1678 ⁵	1417	1440	91	ESV
Pink								
Viva	1888 ⁶	2011 ⁶	1601 ⁶	2036 ⁵	1884	1710	103	V
Harold	2095 ⁵	2032 ⁴	1543 ⁴	1786 ³	1864	1440	103	V
Victor	1989 ⁵	1872 ⁴	1570 ⁴	2233 ³	1916	1410	100	V
Dark Red Kidney								
Montcalm	1598	1451	979	2284 ⁴	1541	1058	105	B
Royal Red	1938 ¹	872 ¹	721 ³	2241 ³	1443	1513	109	B
Mecosta	—	—	974 ³	2055 ³	1515	1135	110	B
Light Red Kidney								
Linden	1455 ⁶	1643 ⁶	1088 ⁶	2747 ⁶	1588	960	109	B
Red Kloud	1241 ⁶	1344 ⁶	792 ⁶	2247 ⁶	1362	1000	96	B
Kardinal	2066 ³	943 ³	941 ³	2369 ³	1580	1297	109	B
Kamiakin	1937 ³	1134 ³	954 ³	2119 ³	1536	1335	111	ESV
Black Turtle Soup								
Black Magic	1765 ⁶	2007 ⁶	1486 ⁶	2374 ⁵	1908	2300	104	ESV
Domino	1906 ⁶	2083 ⁶	1425 ⁵	2423 ⁵	1959	2330	104	ESV
Ebony	2067 ⁶	2077 ⁶	1447 ⁶	2407 ⁵	2000	2280	102	ESV
Midnight	1663 ⁶	2005 ⁶	1403 ⁶	1931 ⁵	1751	2400	104	ESV
T-39	1852 ⁵	2086 ⁶	1530 ⁵	2208 ⁵	1919	2220	102	ESV
LSD 5%	234	187	171	219	90			

¹Irrigated. ²V = vine, SV = short vine, ESV = erect short vine, B = bush. ³One year data. ⁴Two year data. ⁵Three year data. ⁶Four year data.

trate vine. Medium seed. Released by Idaho Agricultural Experiment Station in 1983.

Wyo 167—High yield. Late. Large, prostrate vine. Large 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.

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.

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. Small, navy seed. Resistant to lodging. 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. Large, prostrate vine. Small, pinto seed. 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 42. Reaction of fieldbean varieties to some important pathogens and air pollution¹

Class and variety	Rust ²	Blight ²		Mosaic ²		Anthracnose ³	Fusarium root rot ²	White mold ²	Air pollution ²
		common	halo	V1	V15				
Pinto									
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	—	—
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
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
UI-114	S	S	T	T	T	S	T	S	S
UI-126	S	S	T	T	T	—	T	S	S
UI-129	S	S	T	T	T	—	T	S	S
Wyo 166	S	S	T	T	S	—	S	S	S
Wyo 167	S	S	T	T	S	—	S	S	S
Navy									
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

Table 42 (continued). Reaction of fieldbean varieties to some important pathogens and air pollution¹

Class and variety	Rust ²	Blight ²		Mosaic ²		Anthracnose ³	Fusarium root rot ²	White mold ²	Air pollution ²
		common	halo	V1	V15				
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
Small White									
Aurora	T	S	T	T	T	BG	T	T	T
UI-158	T	—	—	T	T	—	T	T	T
Great Northern									
Emerson ⁴	S	T	T	T	T	—	S	S	S
UI-425	T	—	T	T	T	—	—	S	T
Spinel	T	S	T	T	T	—	—	S	S
Small Red									
UI-37	S	S	S	T	T	—	S	S	S
Pink									
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	—
Dark Red Kidney									
Montcalm	T	S	T	T	T	A	S	S	T
Light Red Kidney									
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
Black Turtle Soup									
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 ⁵	T	S	T	T	T	BGD	T	T	T
T 39	T	S	T	T	T	G	T	T	T

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

FIELDPEA, FABABEAN, AND LUPINE

Fieldpea (*Pisum sativum*) 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 a 1984 Minnesota Report issued by the Minnesota Agricultural Experiment Station (Item No. AD-MR-2339: "Crop Sequence Effects of Pulse Crops and Agronomic Research on Lupine").

Tangierpea 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 and should not be fed to animals.

RECOMMENDED FIELDPEA VARIETIES

Century—Medium yield. Medium 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.

FIELDPEA 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 Svalof A. B. Plant Breeding Station, Sweden. Seed distributed by Bonis and Company, Ltd., Lindsay, Ontario. Variety protection pending.

OTHER FIELDPEA 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.

LUPINE, FABABEAN, AND TANGIERPEA VARIETIES

White lupine varieties "Ultra" and "Kiev" are currently available in Minnesota. "Primorski" and "Eastland" may be available in 1988. "Ultra" white lupine was developed in Germany and improved in Australia and Minnesota. "Kiev" and "Primorski" are Russian varieties. Further information on these and other lupine varieties will be available in 1988.

The fababean variety "Outlook" was developed at the Univ. of Saskatchewan, Saskatoon and licensed by Agric. Canada in 1981, and has performed well in Minnesota trials. "Petite" tickbean, a small-seeded fababean, was released by the Minnesota Agricultural Experiment Station in 1976; and "Minnesota" horsebean was released by the Minnesota Agricultural Experiment Station in 1968.

The tangierpea variety "Tinga" has low yield, is late, viney and indeterminate in maturity, and has small, high protein seed. Used for green manure and may be a potential forage crop but further toxicity tests are needed. Developed in Germany, distributed by SeedTec Development, Box 345, Qu'Appelle, Saskatchewan, Canada S0G 4A0.



Experiment Station agronomist Dan Putnam evaluates new and uncommon crops for potential in Minnesota. Such evaluations include this lupine plot at the Sand Plain Experimental Farm in Becker.

Table 43. Characteristics of fieldpea varieties, fababean, lupine, and tangierpea

Variety	Seed yield					Seeds/ pound	Seed protein ²	Planting to		Plant length
	Becker ¹ 1981-85	Grand Rapids 1981-85	Crookston 1981,85	Roseau 1985	Average 13 trials			bloom	maturity	
	----- lbs/a -----					no.	%	----- days -----		inches
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 ³	3652	1894	3184	2474	2813	1600	25	58	99	20
Tipu ⁴	2104	2944	2636	2561	2544	2260	24	63	105	54
Victoria	2230 ⁵	2363 ⁴	2984 ⁴	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 ⁶									
Fababean	3215	2224	2415	2326	2642	1180	28	61	116	42
Lupine	1978	983 ⁷	77	103	1159	1690	28	59	123	31
Tangierpea ⁴	1231	1347	1507	0	1223	4490	37	65	121	52

¹Irrigated. ²10 percent moisture basis. ³1984-85. ⁴1985. ⁵1982. ⁶Minnesota fababean 1981, Outlook fababean 1982-85, Gela lupine 1981-82, Ultra lupine 1983-85, Tinga tangierpea. ⁷1981, 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.

VARIETIES

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 44. Characteristics of lentil varieties

Variety	Seed yield					Height	Lodging ³	Planting to	
	Grand Rapids 1982-85	Crookston 1981,85	Becker ¹ 1982-84	Seeds/ pound	Seed protein ²			bloom	maturity
	----- lbs/a -----					inches	score	----- days -----	
Brewer ⁴	943	2031	1357	8,890	27.4	18	4.9	60	111
Chilean 78 ⁵	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 ⁶	1043	1525	—	15,120	26.5	17	3.8	63	116
Laird ⁷	343	1344	820	7,440	24.2	21	3.5	67	115
Primera ⁶	554	1895	—	5,670	28.3	18	4.9	64	119
Red Chief ⁴	757	1673	1574	9,070	26.7	18	5.6	60	111
LSD 5%	132	512	164						

¹Irrigated. ²Oven-dry. ³1 = erect, 9 = flat. ⁴1982-85. ⁵1982-84. ⁶1985. ⁷1981-84.

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) ¹	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	16,200	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 10-inch rows.....	60	2,800	56	3/foot of row	May 5 to May 25
20-inch rows.....			56	6/foot of row	
30-inch rows.....			56	9/foot of row	
40-inch rows.....			56	12/foot of row	
Sunflower Nonoilseed.....	24	4,300	4	17,000/acre	May 1 to June 15
Oilseed.....	27	7,700	3	23,000/acre	
Wheat Durum.....	60	12,100	90	25/square foot	Early spring
Hard red spring.....		15,200	80	28/square foot	Early spring
Winter.....		14,500	75	25/square foot	August 20 to September 20
Other Crops					
Adzuki.....	60	3,500	25	78,000/acre	May 20 to June 10
Annual canarygrass.....	50	58,000	30	40/square foot	Early spring
Buckwheat.....	48	14,900	50	17/square foot	June 15 to July 20
Canola <i>B. napus</i>	50	140,000	8	25/square foot	May
Canola <i>B. campestris</i>	50	210,000	5	25/square foot	May
Fieldpea.....	60	2,300	180	9/square foot	Early spring
With 1½ to 2 bushels of oat.....			70	4/square foot	
Fababean-medium size.....	60	1,300	180	5/square foot	Early spring
With 2 bushels of oat.....			60	2/square foot	
Lentil-small.....	60	15,600	55	20/square foot	Early spring
Lupine 6- to 8-inch rows.....	60	1,500	170	6/square foot	Early spring
30-inch rows.....			70	6/foot of row	
Millet Foxtail.....	48	218,000	15	75/square foot	June 15 to July 15
Proso.....	56	65,000	20	30/square foot	June 15 to July 15
Mustard Yellow.....	56	90,000	12	25/square foot	May
Oriental, Brown.....	50	180,000	6	25/square foot	May
Rape Forage.....	50	145,000	6	20/square foot	Early spring with oat
Oilseed.....	50	136,000	8	25/square foot	May
Sudangrass 18- to 40-inch rows.....	40	44,000	10	25/foot of row	May 20 to June 10
6- to 14-inch rows.....			20	20/square foot	
Sweetclover.....	60	240,000	10	55/square foot	Early spring
Tangierpea.....	60	4,500	85	9/square foot	Early spring
Wild rice (wet).....	25	7,900	33	6/square foot	Late fall

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