

1987 EDITION

CONTENTS

FORAGE CROPS	
Alfalfa	3
Birdsfoot Trefoil	7
Bromegrass	7
Orchardgrass	7
Red Clover	7
Reed Canarygrass	8
Tall Fescue	8
Timothy	8
GRAIN CROPS	
Annual canarygrass	9
Barley	10
Buckwheat	11
Corn	12
Grain Sorghum	12
Millet	13
Oat	14
Wheat, Durum	16
Wheat, Hard Red Spring ..	16
Wheat, Winter	19
Wild Rice	20
Winter Rye	21
OILSEED CROPS	
Flax	21
Mustard, canola, oilseed rape	22
Soybean	24
Sunflower	34
PULSE CROPS	
Adzuki	38
Fieldbean	38
Fieldpea, fababean, lupine	42
Lentil	43
PLANTING RATE AND DATE...	44

VARIETAL TRIALS

DE FARM CROPS

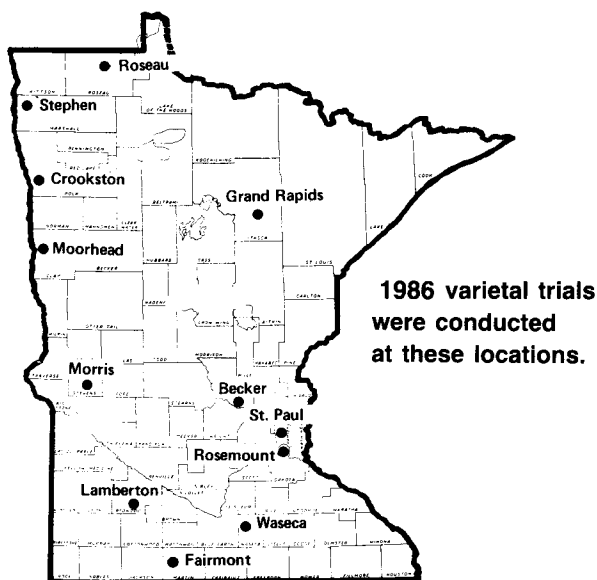
AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF MINNESOTA

MINNESOTA REPORT 24—1987 (ITEM NO. AD-MR-1987)

VARIETAL TRIALS OF FARM CROPS

INTRODUCTION

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 CLASSIFICATION

Varieties of many of the crops are classed into three groups: "recommended varieties," "varieties not adequately tested" and "other varieties." Varietal descriptions are in alphabetical order within the groups. The classifications of varieties as "recommended varieties" and "other varieties" are determined each year by the Minnesota Agricultural Experiment Station Crop Variety Review Committee. A variety is usually not eligible for the "recommended varieties" group unless it has been better than other varieties in important characteristics in 3 years of testing. New varieties from other public experiment stations and private plant breeders, but not sufficiently evaluated here, are listed as "varieties not adequately tested." Information about these varieties is presented 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 1987 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, the higher yielding variety was superior in yield. If the difference is less than the LSD, the yield difference was probably due to environmental rather than varietal differences. The 5 percent significance level used in this report is based on odds of 19 to 1 that yields differing by the amount of the LSD were truly different.

Data for varieties not included in all trials have been adjusted so that averages in each table for different numbers of years can be compared directly. However, use of the LSD for these comparisons is not valid.

These trials are not designed for crop (species) comparisons, because the various crops are grown on different fields or with different management. The data should only be used to compare varieties within a table.

Relative maturities of varieties are indicated in the tables as date mature, heading, or blooming; days to mature, heading, or blooming; or moisture percentage at harvest.

AUTHORS AND RESEARCHERS

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

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.F. 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 Chairman
Photo Editor
Editor

Leland L. Hardman
David L. Hansen
Anne Gillespie Lewis

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

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 1987, are listed in this report.

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

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

Table 1. Average yields of alfalfa varieties expressed as percentage of Vernal for all tests in Minnesota, 1959-86

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	98	93	96	90	95	92
Ladak	♦						3	87	88	78	89	88	82
Spredor 2	♦	♦		♦		♦	4	95	89	91	82	93	87
Teton	♦		♦	♦			7	89	93	86	93	91	90
Travois	♦	♦	♦	♦			5	88	88	88	87	88	88
Maverick	♦	♦	♦	♦	*	♦	6	96	101	92	86	98	91
WINTERHARDY													
Wrangler	*	♦				♦	4	99	101	130	130	100	130
Victoria	♦						2	99	100	100	95	100	98
Vernal, tons/acre, 15% M	♦	♦	♦	*	♦	♦	80	4.8	4.6	4.5	4.4	4.7	4.2
Baker	*	♦	*	*	♦	♦	15	97	98	105	106	97	105
Dawson	♦	♦	♦	♦			8	100	104	104	100	102	101
526	*	*	*	*	*	*	6	107	109	113	120	108	114
636	*						1	111	112	—	—	111	—
Vancor	♦	*	♦	♦	♦	♦	6	103	100	102	88	102	95
G2818	♦	♦		♦		♦	5	102	104	97	95	103	96
Agate	♦	♦	♦	♦	♦	♦	29	98	99	101	98	99	100
Iroquois	♦	♦	♦	♦	♦	*	15	106	104	104	109	105	106
Blazer	*	*	♦	♦	♦	♦	10	105	104	111	110	104	110
629	*						1	105	106	106	—	105	106
Thunder	*	*	♦	♦	♦	♦	7	103	100	104	104	102	104
Phytor	♦	*	♦	♦	*	♦	8	102	104	107	108	103	108
Surpass	*						1	114	113	—	—	113	—
Valor	♦	*	♦	*	♦	♦	9	100	103	103	105	101	104
120	*	*	♦	*	*	*	11	107	110	114	113	108	114
Ranger	♦	♦	♦	♦	♦	♦	26	97	98	97	99	97	97
532	♦	*	*	♦	♦	*	7	110	103	104	108	107	105
Dart	*						1	111	—	—	—	111	—
Milkmaker	*						2	106	108	102	107	107	104
Polar II	♦	♦	♦	♦	♦	♦	7	99	99	98	79	99	95

Table 1 (continued). Average yields of alfalfa varieties expressed as percentage of Vernal for all tests in Minnesota, 1959-86

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													
Arrow	*						2	112	115	—	—	113	—
Big Ten	◆	◆				◆	3	103	104	—	—	104	—
Marathon	◆	◆	◆	◆			6	104	104	100	92	104	98
Sparta	*						2	107	108	—	—	108	—
Apollo	◆	◆		◆	*	◆	11	101	100	103	107	101	105
Impact							0	—	—	—	—	—	—
Oneida	*	*	◆		◆	*	8	104	105	105	105	104	105
Bell Ringer	*						2	111	105	—	—	109	—
Salute	◆						2	103	110	—	—	105	—
Vernema	◆	*	*	◆		*	5	108	101	101	97	105	100
Elevation	*						2	112	110	108	—	111	108
Expo	◆	◆	◆	*	*	◆	6	99	103	102	98	102	100
G7730	◆	◆	◆		*	◆	6	100	103	107	107	101	107
Magnum	*	◆	*	◆	◆	◆	8	104	102	106	107	103	106
Perry	◆	◆	*		◆		5	102	104	108	108	103	108
624	◆						2	108	109	—	—	108	—
Advantage	◆	*	◆	◆	*	◆	7	105	103	103	104	104	103
Answer	◆	*	◆	*		◆	7	105	102	105	102	103	104
Commandor	◆						2	110	107	—	—	109	—
Dynasty	*						1	112	—	—	—	112	—
Endure	*	◆				◆	4	105	108	111	109	112	110
Primal	◆	◆	*	*		*	8	107	102	101	100	105	100
Apollo II	◆	◆	◆	*	◆	◆	8	101	102	96	97	102	97
Duke	◆	◆	◆	*	◆	◆	7	102	101	102	97	102	100
DK 135	◆	*	*	◆	◆	◆	6	102	104	103	100	103	102
Peak	*	*	◆	*		◆	9	106	106	112	112	106	112
Preserve	◆	◆				◆	4	103	98	93	103	100	98
Saranac	◆	◆	◆	◆	◆	◆	39	104	103	101	102	103	102
Thor	◆	◆	◆		◆	◆	10	103	103	100	102	103	102
Trident	◆	◆	◆	◆	◆	◆	8	103	104	103	108	103	105
Spectrum	◆	*	◆	*	◆	◆	7	105	102	96	90	103	94
Drummor	◆	◆			◆	◆	4	100	104	90	103	102	96
G-2815	◆	◆	◆	◆	◆	◆	7	99	98	103	102	99	103
Target	◆						1	103	—	—	—	103	—
Trumpetor	◆	*	*	◆	◆	*	8	104	105	99	92	104	96
Aquarius	◆	◆		◆	◆		5	97	103	99	94	100	97
Decathlon	◆	◆		◆		◆	5	100	97	88	98	99	93
630	*						2	111	112	111	—	112	111
Armor	◆	*	◆	◆	*	*	8	105	105	107	101	105	104
Crown							0	—	—	—	—	—	—
Hi-Phy	◆	*	◆	◆	◆	◆	7	102	107	111	118	105	115
5432	◆						1	109	—	—	—	109	—
Eagle	◆	◆				◆	3	103	100	87	—	102	87
Epic	*	◆	*	*		◆	9	101	108	110	116	104	113
Magnum Plus	*						1	109	112	—	—	110	—
WL 320	*	*				*	3	107	113	—	—	110	—
G-2852	*						2	110	107	100	—	109	100
Cimarron	◆	*		◆		◆	4	105	90	91	94	98	93
Shenandoah	◆	*				*	3	109	99	95	91	104	93
Maxim	◆	◆				◆	3	103	94	—	—	99	—
WL 316	◆	◆		*	◆	◆	6	101	106	98	99	104	99
Challenger	◆	◆				◆	4	101	95	82	100	98	91

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 for one or more tests.

winterhardy varieties usually reach 1/10 bloom several days earlier than more winterhardy varieties. They are also characterized by rapid recovery after harvest. 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.

Nonwinterhardy varieties are characterized by very rapid growth rate until fall freeze-up. They produce yields similar to 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 plowdown in the seeding year. The Minnesota Agricultural Experiment Station and USDA released the non-dormant variety, Nitro, in 1986. Nitro is a special-purpose alfalfa designed as a one-year hay source and a fall plowdown 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. Limited amounts of Nitro seed are available from Peterson Seed Co. for planting in 1987. 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 70, 183, WL 504, WL 508, WL 514, WL 515, WL 600, UC Cibola, UC Salton, Validor, 572, and 581.

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



Nitro alfalfa, shown being plowed under, is a 1986 release by the USDA and the Agricultural Experiment Station. The annual alfalfa is expected to be widely used for its nitrification purposes when it becomes available generally. It will be for sale in limited quantities in 1987.

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

Variety	Developer or Marketer ¹	Winter hardiness (index) ²	RESISTANT PLANTS ³			Anthracnose (rating) ⁴	Verticillium wilt (rating) ⁴
			Bacterial wilt (percent)	Phytophthora root rot (percent)	Fusarium wilt (percent)		
VERY WINTERHARDY							
-----highest value best-----							
Rambler	Agr. Canada ^R	8.0	16	3	25	S	—
Prowler	Pride Seed Co. ^a	7.9	72	2	18	S	—
Ladak	USDA (foreign introduction) ^L	7.5	8	2	29	S	—
Spredor 2	Northrup King Co. ^T	7.5	58	5	24	S	—
Teton	S. Dakota Agr. Exp. Sta. ^{GRc}	7.4	15	7	26	S	—
Travois	S. Dakota Agr. Exp. Sta. ^{CGLQRc}	7.4	37	1	15	S	—
Maverick	AgriPro ^d	7.3	42	17	36	S	—
WINTERHARDY							
Wrangler	USDA & Nebraska Agr. Exp. Sta. ^{ORWzcf}	7.0	36	47	42	LR	LR
Victoria	Arkansas Agr. Exp. Sta. ^X	6.9	5	12	48	S	—
Vernal	Wisconsin Agr. Exp. Sta. & USDA ^{CGLPQRUWzcf}	6.5	42	5	32	S	—
Baker	USDA & Nebraska Agr. Exp. Sta. ^{GORc}	6.5	49	2	36	LR	—
Dawson	USDA & Nebraska Agr. Exp. Sta. ^Q	6.5	15	1	35	S	—
526	Pioneer Hi-Bred International Inc. ^Y	6.5	57	8	15	LR	—
636	Garst Seed Co. ^I	6.3	54	54	47	MR	R
Vancor	Northrup King Co. ^T	6.2	56	22	38	R	—
G2818	Funk Seeds Intl. ^H	6.1	58	24	44	LR	—
Agate	USDA & Minnesota Agr. Exp. Sta. ^{GQRWzcf}	6.0	65	43	54	MR	—
Iroquois	Cornell University ^{RWz}	6.0	61	1	22	S	—
Blazer	Land O'Lakes ^P	5.9	49	24	26	LR	LR
629	Garst Seed Co. ^I	5.8	51	31	62	MR	MR
Thunder	AgriPro ^d	5.7	43	49	55	MR	—
Phytor	Northrup King Co. ^T	5.5	34	30	39	S	—
Surpass	Cenex ^c	5.5	49	45	47	MR	R
Valor	Land O'Lakes, Inc. ^P	5.5	36	2	30	LR	LR
120	DeKalb-Pfizer Genetics ^F	5.5	57	39	20	LR	—
Ranger	USDA & Nebraska Agr. Exp. Sta. ^{CGLORW}	5.4	18	4	25	S	—
532	Pioneer Hi-Bred International Inc. ^Y	5.4	63	7	37	MR	—
Dart	AgriPro ^S	5.3	63	62	46	R	R
Milkmaker	Lovelock Seed Co., Inc. ^N	5.3	43	38	56	MR	—
Polar II	Pride Seed Co. ^a	5.3	57	60	34	S	—

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

Variety	Developer or Marketer ¹	Winter hardiness (index) ²	RESISTANT PLANTS ³			Anthracnose (rating) ⁴	Verticillium wilt (rating) ⁴
			Bacterial wilt (percent)	Phytophthora root rot (percent)	Fusarium wilt (percent)		
MODERATELY WINTERHARDY							
-----highest value best-----							
Arrow	AgriPro ^{dn}	5.2	57	58	61	MR	R
Big Ten	Premium Seed Co. ^{DZ}	5.2	53	30	48	MR	—
Marathon	Cargill, Inc. ^B	5.2	36	2	13	S	—
Sparta	Land O'Lakes ^P	5.2	48	20	22	S	—
Apollo	AgriPro ^{dgh}	5.1	36	36	40	LR	—
Impact	Peterson Seed Co., Inc. ^X	5.1	65	57	46	MR	R
Oneida	Cornell University ^{WZF}	5.1	62	52	62	S	—
Bell Ringer	Lovelock Seed Co., Inc. ^J	4.9	41	8	27	LR	MR
Salute	United AgriSeeds, Inc. ^{De}	4.9	54	34	44	MR	—
Vernema	USDA & Washington Agr. Exp. Sta. ^{Rf}	4.8	21	13	38	S	MR
Elevation	Jacques Seed Co. ^M	4.7	53	42	40	R	MR
Expo	Paymaster Seeds ^V	4.7	37	47	42	MR	—
G7730	Funk Seed Intl. ^{HW}	4.7	55	62	62	LR	—
Magnum	Dairyland Seed Co. Inc. ^E	4.7	51	5	32	MR	—
Perry	USDA & Nebraska Agr. Exp. Sta. ^{QR}	4.7	30	10	38	S	—
624	Garst Seed Co. ^I	4.7	45	19	37	MR	—
Advantage	DeKalb-Pfizer Genetics ^F	4.6	42	44	32	MR	—
Answer	Midland Cooperatives, Inc. ^C	4.6	50	66	58	LR	—
Commandor	Northrup King Co. ^T	4.6	51	45	34	HR	MR
Dynasty	Dairyland Seed Co., Inc. ^E	4.6	60	46	46	MR	R
Endure	PAG Seeds ^U	4.6	45	28	41	MR	R
Primal	Pride Seed Co. ^a	4.6	62	9	33	S	—
Apollo II	AgriPro ^{dgh}	4.5	43	54	47	MR	MR
Duke	AgriPro ^S	4.5	43	55	43	MR	—
DK 135	DeKalb-Pfizer Genetics ^F	4.5	26	20	46	MR	MR
Peak	Research Seeds, Inc. ^{LZ}	4.5	52	16	28	LR	LR
Preserve	Pride Seed Co. ^a	4.5	40	19	35	LR	—
Saranac	Cornell University ^Z	4.5	49	3	34	S	—
Thor	Northrup King Co. ^T	4.5	69	1	30	S	—
Trident	PAG Seeds ^U	4.5	37	71	55	MR	—
Spectrum	W. L. Research Inc. ^C	4.5	56	29	33	MR	—
Drummor	Northrup King Co. ^T	4.4	38	29	17	MR	—
G 2815	Funk Seed Intl. ^H	4.4	51	16	56	MR	—
Target	Ziller Seed Farm, Inc. ^g	4.4	66	30	43	MR	—
Trumpetor	Northrup King Co. ^T	4.4	28	8	51	R	MR
Aquarius	Lincoln Seed & Feed Co. ^Q	4.3	75	2	47	HR	—
Decathlon	Cargill, Inc. ^{BV}	4.3	66	21	43	MR	MR
630	Garst Seed Co. ^I	4.3	59	45	36	MR	MR
Armor	AgriPro ^{dgh}	4.2	39	43	44	MR	—
Crown	Paymaster Seeds ^V	4.1	47	45	45	HR	R
Hi-Phy	Farmers Forage Res. Coop. ^C	4.1	64	27	57	—	—
5432	Pioneer Hi-Bred International, Inc. ^Y	4.1	61	23	68	—	R
Eagle	Asgrow Seed Co. ^A	4.0	58	36	37	R	MR
Epic	Larry Peterson, Ltd. ^{LOb}	3.9	58	34	45	S	—
Magnum Plus	Dairyland Seed Co., Inc. ^E	3.9	39	28	41	MR	—
WL 320	W-L Research, Inc. ^L	3.8	42	37	58	MR	MR
G 2852	Funk Seeds Intl. ^H	3.7	56	38	43	HR	R
Cimarron	Great Plains Research ^k	3.6	44	15	52	HR	LR
Shenandoah	Great Plains Research ^K	3.6	56	12	36	HR	—
Maxim	Cenex ^C	3.6	42	15	42	MR	R
WL 316	W-L Research, Inc. ^{CL}	3.6	19	9	53	HR	R
Challenger	Cargill, Inc. ^B	3.5	46	46	22	R	—

¹1987 seed sources are listed at the end of the forage crops section. ²Based on fall growth after cutting 1st week of September: 1 = tallest (least winterhardy), 9 = shortest. ³Plants with little or no injury are classified as resistant. 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).

BACTERIAL WILT—This disease is prevalent in most areas of the state. Wilt-susceptible varieties are poor risks and should not be grown, because they generally show losses in stand by the end of the second year after seeding. In some cases where infection is severe, stand losses are often observed by the end of the first year after seeding. Stand reductions after winter often are due to a combination of wilt damage and winter injury.

PHYTOPHTHORA ROOT ROT—This fungus disease is important on poorly drained soils. It can cause stand losses of seedlings and can contribute to lower productivity in older stands if the soil remains wet for a week or more.

FUSARIUM WILT—The fungus that causes Fusarium wilt is present in most soils. In Minnesota it is usually not a serious problem by itself, but it contributes to stand decline in combination with other

disease organisms. Resistance to Fusarium wilt in addition to resistance to bacterial wilt and Phytophthora root rot contribute to longer-lived stands.

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

VERTICILLIUM WILT—This is a new, potentially destructive fungus disease that was first found in several Minnesota fields in 1981. It has usually been found in 2- or 3-year-old fields. If the disease has been identified in the immediate vicinity, consider planting a resistant variety. Those varieties having low, moderate and resistant ratings are indicated in Table 2.

BIRDSFOOT TREFOIL

Birdsfoot trefoil is primarily a pasture legume but also can be harvested for hay. It is suitable on sandy soils of medium to low fertility, but is tolerant to a wide range in soil fertility, acidity, and drainage. It is persistent when grown with bluegrass, but is also suitable with timothy. This highly palatable forage will not cause bloat.

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

relative 3-year yield of varieties sold in Minnesota (percent of Empire) and 1987 sources of seed¹ are: Leo-112^{RWcf}, Carroll-109^Z, Dawn-108^{dg}, Norcen-105^{CLPWZcf}, and Empire-100^{CGLPQRWZcf}. No data are available on Fergus^{dg}. Norcen was released in 1983 by the agricultural experiment stations of Minnesota and six other states. It has performed exceptionally well in grazing trials.

¹1987 seed sources are listed at the end of the forage crops section.

BROMEGRASS

Bromegrass is generally grown for hay in mixture with alfalfa or is used as pasture in mixture with other grasses and legumes. Varieties can be classed as southern, intermediate and northern types. Varieties of the southern type may not be higher yielding, but they are generally less susceptible to leaf diseases and earlier in maturity than northern types. Varieties presently being sold in Minnesota are of the southern type. All varieties are winterhardy. Some stand losses may occur when bromegrass is managed under three- and four-cut alfalfa harvest systems.

Varieties were evaluated in pure stands for about 15 years at most Minnesota experiment stations. Average hay yields for Fox bromegrass were about 4.7 tons/acre at Grand Rapids and 3.6 tons/acre at the other locations. The relative yield of varieties sold in Minnesota (percent of Fox) and 1987 sources of seed¹ are: Barton-105^P, Rebound-102^{GQ}, and Lincoln-95^{CGLPQRW}. No data are available on Carlton^{Cf} and Cottonwood^O.

¹1987 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 1987 sources of seed¹ are: Dart-102^P, Hallmark-100^C, Sterling-100^{QWf}, Napier-100^U, Comet-98^T, and Potomac-87^{CGLPQRWZcf}. No data are available on Able^C and Crown^{Udg}.

¹1987 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 currently sold in Minnesota can persist for 3 years with good winter snow cover.

Varieties were evaluated at Rosemount, Grand Rapids, Lamber-ton, 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 1987 sources of seed¹ are: Florex-116^T, Arlington-113^{CLPRWZcf}, Prosper I-111^{la}, Lakeland-100^{LRW}, and Redman-99^C. No data are available on: Atlas^T, Alta Swede^O, Reddy^C, Redfield^U, Redland 11^{dg}, and Ruby^E.

¹1987 seed sources are listed at the end of the forage crops section.



Although many of the varietal trials are done at the branch stations and at Rosemount, a considerable number are also done on the St. Paul campus of the University of Minnesota. Here, a field of soybean marks the north end of the campus.



Red clover, shown being swathed, is one of several forage crops that are often grown in conjunction with a livestock or dairy operation.

REED CANARYGRASS

Reed canarygrass is adapted throughout Minnesota for use as hay, pasture, or silage. It is one of the best grass species for use on poorly drained soil, in swampy areas, and in areas subject to spring flooding. The species is also well adapted to upland soils. The seedling vigor is not as good as that of other commonly used forage grasses. Prior to 1985 common reed canarygrass had been described as being less palatable than most species seeded for hay and pasture, but cattle produced well on the grass if it was used before it became mature. The latest development in reed canarygrass breeding has been the development of varieties with low concentrations of indole alkaloids. In grazing trials, lambs and steers gained more weight and sheep had less diarrhea on low-alkaloid varieties than on the common reed canarygrass varieties. Satisfactory pasture utilization oc-

curs if the grass is grazed when it is between 6 and 24 inches tall. Harvesting hay between heading and early bloom is preferred, because the quality declines with advanced maturity. Available varieties are winterhardy and persistent.

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

Seeds of two low-alkaloid varieties: Palaton^P and Venture^{WXZ}, are available¹.

¹1987 seed sources are listed at the end of the forage crops section.

TALL FESCUE

Tall fescue is a relatively new forage grass in Minnesota. It may be tried in mixtures with other grasses and legumes. It establishes rapidly, withstands trampling, tolerates summer drought, and produces fall season pasture when other grasses become dormant. This bunchgrass is subject to winter injury, but may persist and remain productive in areas with reliable snow cover.

Varieties were evaluated for about 8 years at Grand Rapids and Rosemount, Minnesota. Average annual hay yields were about 4.2

tons/acre at both locations for the variety Kentucky-31. The relative yield of varieties sold in Minnesota (percent of Kentucky-31) and 1987 sources of seed¹ are: Kenhy-102^f, Kentucky-31^{GLPQRZef}, Forager-92^C, and Fawn-78^{CR}. No data are available for: Arid^Z, Falcon^C, and Mustang^Z.

¹1987 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 1987 sources of seed¹ are: Timfor-100^{Ta} and Climax-95^{CLMPQRWcf}. No data are available for: Basho^f, Mohawk^{CQ}, Mor-tim^U, and Top-tim^P.

¹1987 seed sources are listed at the end of the forage crops section.

1987 forage seed sources are: A. Asgrow Seed Co., 7000 Portage Rd., Kalamazoo, MI 49001; B. Cargill Seed Div., P.O. Box 5645, Mpls., MN 55440; C. Cenex Seed Dept., Station 570, P.O. Box 64089, St. Paul, MN 55164-0089; D. Dahlgren & Co., 1220 Sunflower Street, Crookston, MN 56716; E. Dairyland Seed Co., Inc., P.O. Box 958, West Bend, WI 53095; F. DeKalb-Pfizer Genetics, 3100 Sycamore Rd., DeKalb, IL 60115; G. Discount Farm Center, Inc., P.O. Box 84, Watertown, SD 57201; H. Funk Seeds, Int'l, 1300 W. Washington St., Bloomington, IL 61701; I. Garst Seed Co., P.O. Box 300, Coon Rapids, IA 50058; J. George's Seed Outlet, Rt. 1 Highway 10 W., Ellsworth, WI 54011; K. Great Plains Research, Inc., P.O. Box 1745, Stillwater, OK 74074; L. Interstate Seed Co., P.O. Box 470, Fargo, ND 58107; M. Jacques Seed Co., Prescott, WI 54021; N. Kaltenberg Seed Farms, P.O. Box 278, Waunakee, WI 53597; O. Keltgen Seed Co., Box A, Olivia, MN 56277; P. Land O'Lakes, Inc., P.O. Box 1395, Mpls., MN 55440; Q. Lincoln Seed, 211 Pearl St., Sioux City, IA 51102; R. Mohn Seed Co., Rt. 1 Box 152, Cottonwood, MN 56229; S. NAPB, Inc., P.O. Box 2955, Mission, KS 66201; T. Northrup King Co., 7500 Olson Memorial Hwy., Golden Valley, MN 55427; U. PAG Seeds, P.O. Box 5645, Mpls., MN 55440; V. Paymaster Seeds, P.O. Box 5645, Mpls., MN 55440; W. Peterson-Biddick Co., Box 190, 102 Alrich S.E., Wadena, MN 56482; X. Peterson Seed Co., P.O. Box 346, Savage, MN 55378; Y. Pioneer Hi-Bred Int'l, Inc., P.O. Box 287, 7305 N.W. 62nd Ave., Johnston, IA 50131; Z. Premium Seed Co., 7800 E. State Hwy. 101, Shakopee, MN 55379; a. Pride Co., Inc. 7500 Olson Memorial Hwy, Golden Valley, MN 55427; b. Profiseed, Inc., Rt. 2, Hampton, IA 50441; c. The Sexauer Co., P.O. Box 58, Brookings, SD 57006; d. Sigco Research, Inc., P.O. Box 289, Breckenridge, MN 56520; e. United Agriseeds, Inc., P.O. Box 4011, Champaign, IL 61820; f. Werner Farm Seeds, R.R. 1 Box 28A, Dundas, MN 55019; g. Ziller Seed Farms, Inc., R.R.1 Box 122, Bird Island, MN 55310; h. L.L. Olds Seed Co., Box 7790, 2901 Packers Ave., Madison, WI 53707.

Grain Crops

ANNUAL CANARYGRASS

Annual canarygrass is grown as a cash grain crop and used for feeding caged and wild birds. Kittson County is the North American production and processing center for the crop.

RECOMMENDED VARIETIES

Alden—Medium yield, medium maturity and height. Poor lodging resistance. Medium size seed of medium test weight. May outyield Keet in favorable environments for canarygrass. Devel-

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

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

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

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

Variety	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-row, semi-smooth awn, short rachilla hairs, colorless aleurone. Awns may drop off as crop approaches maturity. Threshes easily. *Classified as a malting variety by AMBA.* Resistant to stem rust and moderately resistant to spot blotch. Susceptible to loose smut. Developed by Minnesota Agricultural Experiment Station from cross of Cree and Bonanza. Released in 1978.

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

OTHER VARIETIES

Azure—High yield. Medium maturity. Six-row, semi-smooth awn, long rachilla hairs, blue aleurone. *Classified as a malting variety by AMBA.* Resistant to stem rust and spot blotch. Yielded 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. Later maturing than Morex. Six-row, semi-smooth awn, long rachilla hairs, blue aleurone. *Classified as a malting variety by AMBA.* Resistant to stem rust. Susceptible to spot blotch. Developed by Agriculture Canada, Brandon, from a cross involving Vantage, Jet, Vantmore, Parkland and Conquest. Licensed in 1970.

Bowman—Medium yield. Medium maturity. Very good kernel plumpness. Medium lodging resistance. Two-row, smooth awns, long rachilla hairs, and colorless aleurone. Not approved for malting and brewing by AMBA. Limited demand for two-row 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.



Barley, an ancient crop, is widely grown in North Dakota and in northwestern Minnesota. These plots are growing at the Northwest Experiment Station at Crookston.

Table 5. Yields of barley varieties in bushels per acre, 1982-86

Variety	Location						
	Crookston 6 ¹	Morris 8	Stephen 2	St. Paul 3	Lamberton 1	Average 20 locations	Roseau 2
Larker	77	83	64	68	67	73	—
Morex	80	74	72	73	78	78	54
Robust	83	80	71	79	88	81	64
Hazen	86	82	70	85	82	83	63
LSD 5%	5	4	16	12	16	5	24

¹Number of trials.

Table 6. Characteristics of barley varieties, 1982-86

Variety	Heading day (June)	Height (inches)	Lodging (percent)	Plump kernels (percent)	Seeds/ pound (number)	Reaction to disease		
						Stem ¹ rust	Spot ¹ blotch	Net blotch (1-5) ²
Larker	25	33	36	87	12,700	R	S	3.6
Morex	25	34	27	84	13,200	R	MR	2.9
Robust	27	33	22	86	12,600	R	R	1.6
Hazen	27	32	24	91	11,900	R	R	1.8

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

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

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



Agronomists Erv Oelke, left, and Deon Stuthman, look closely at barley plots. Station releases are grown by the majority of Minnesota barley growers, with Robust, a 1983 release, the leading variety grown in Minnesota, with 78 percent of the planted acres in 1986.

BUCKWHEAT

RECOMMENDED VARIETIES

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

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

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

OTHER VARIETIES

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

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

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

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



Buckwheat in bloom. Buckwheat flour is still used for making pancakes, but most buckwheat grown is exported to Japan.

Table 7. Yields of buckwheat varieties in pounds per acre

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

Table 8. Characteristics of buckwheat varieties, seven location average

Variety	Planting to bloom (days)	Lodging (score) ¹	Height (inches)	Weight/ 100 seeds (grams)	Seeds/ pound (number)	Test weight/ bushel (pounds)
Mancan	32	4.7	40	2.9	15,640	44
Manor	32	4.5	40	2.8	16,200	44
Winsor Royal	32	4.2	40	3.0	15,120	44

¹ = erect, 9 = flat.

CORN

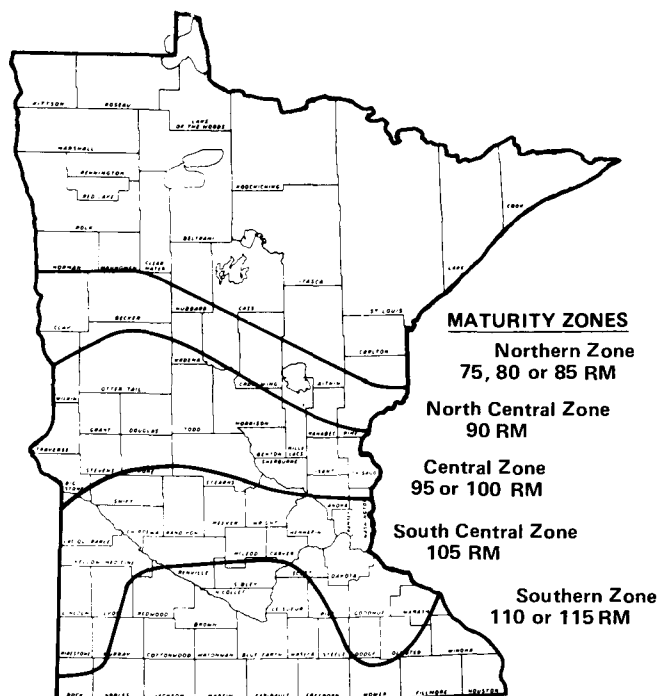
Many corn hybrids are produced by private companies. About 1,400 hybrids were registered for sale in Minnesota in 1986. Information on the performance of these closed-pedigree or private hybrids is usually available from the companies selling them.

The Minnesota Agricultural Experiment Station conducts research in corn breeding, including the development of inbred lines which are used as parents of hybrids. These Minnesota inbreds, designated by the letter "A", are released to private companies through the Minnesota Crop Improvement Association. Private companies may use these inbreds to produce hybrid seed corn for farmers. Information on the performance of these inbreds is available from the Corn Breeding Project, 411 Borlaug Hall, University of Minnesota, 1991 Buford Circle, St. Paul, MN 55108.

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

Table 9. Description of some recent Minhybrids

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



GRAIN SORGHUM

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

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

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

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

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

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

Hybrid and company	Grain yield/acre (pounds) ¹			Head moisture (percent) ²			Test weight/ bushel (pounds)	Planting to heading (days)	Lodging (percent)
	Morris	Crookston	Grand Rapids	Morris	Crookston	Grand Rapids			
MI, Minnesota AES	4563	4195	1206	21	27	27	57	69	53
NK 1040, Northrup King	5245	4849	1770	26	29	36	56	68	11
RS 455, Minnesota AES 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/acre (pounds) ¹		Head moisture (percent)		Test weight/ bushel (pounds) ⁴	Seeds/ pound (number) ⁴	Planting to heading (days) ⁴	Height (inches) ⁵
	1984	1978-79, 81-84	September 15 ²	October 2 ³				
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 VARIETIES

FORAGE

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

GRAIN

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

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

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

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

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

OTHER VARIETIES

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

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

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

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

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

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

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

Type and variety	Grain ¹			Forage ²		
	Rosemount	Becker	Average	Rosemount	Becker	Average
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 (score) ¹	Height (inches)	Seeds/pound (thousands)	Test weight/ bushel (pounds)
	heading (days)	maturity (days)				
Foxtail						
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.



USDA technician Richard Halstead, left, and Jeff Dyrud, a student employee, harvesting oat plots. Much of the research that is the hallmark of the Agricultural Experiment Station involves joint efforts of station and USDA scientists and staff.



Oats and barley varieties with varying growth habit are being evaluated as companion crops for establishing alfalfa.

RECOMMENDED VARIETIES

Moore—Late, high yield, tall, fair lodging resistance, medium test weight and groat percent, low protein percent, white seed. Some resistance to crown rust and smut, some tolerance to red leaf. Selected at Minnesota Agricultural Experiment Station from a cross between Lodi and Mn 65B 1286, a crown rust-resistant selection. Released in 1979.

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

Preston—Early, medium yield and height, 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, good 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, high 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.

OAT

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

VARIETIES NOT ADEQUATELY TESTED

Don—Early, very high yield, poor lodging resistance, very high test weight, high groat percent, low protein percent, white seed, resistant to crown rust and smut, 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, and very high groat percent, medium protein percent, ivory seed. Resistant to crown rust, susceptible to smut, tolerant to red leaf. Selected at the Illinois Agricultural Experiment Station from a cross involving Clintford and Portal. Released in 1985.

Hyttest—Medium maturity, yield and height, poor lodging resistance, very high test weight, high groat 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, cream color seed. Susceptible to crown rust and smut. 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.

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

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

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, groat percent and protein percent, yellow seed. Susceptible to crown rust, resistant to smut, some tolerance to red leaf. Selected at Purdue Agricultural Experiment Station from a cross involving many lines. Released in 1973. Seed sale regulated by U.S. Variety Protection Act.

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

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

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.

Table 14. Yield of oat varieties in bushels per acre, 1984-86

Variety	Rosemount	Waseca	Lamberton	Morris	Crookston	Grand Rapids	Average		Roseau	Stephen ¹
							6 locations			
Webster	93	96	96	95	110	71	94		—	—
Starter	95	101	108	107	112	77	100		96 ²	64
Preston	88	82	96	96	105	75	90		85	69
Don ²	92	114	133	141	125	104	118		—	78
Ogle	94	98	87	87	122	98	98		103	96
Lyon	74	89	75	86	107	70	83		99	83
Hazel ²	96	101	114	137	127	86	110		—	104
Steele	105	107	94	129	127	102	111		112	102
Moore	92	99	96	98	126	81	99		100	96
Proat	92	93	90	116	116	95	100		94 ²	87
LSD 5%	8.3	8.2	11.4	7.9	9.8	6.9	3.5		10.8	12.2

¹1984-85 and 86. ²1985-1986.

Table 15. Characteristics of oat varieties, 1984-86^a

Variety	Heading (date)	Height (inches)	Lodging (score) ^b	Seeds/pound (number)	Test weight/bushel (pounds)	Groat (percent)	Protein percent		Protein/acre (pounds)	Reactions to disease ^c	
							groat	seed		crown rust	smut
Webster	6-21	35	2.2	15970	40	75	16.5	12.3	369	MR	S
Starter	6-21	35	1.7	15958	42	76	18.1	13.7	436	S-MS	R
Preston	6-22	36	2.0	17475	41	75	19.9	15.0	432	MS	R
Don ^d	6-23	35	2.5	14476	43	76	15.5	11.8	443	HR-R	R
Ogle	6-25	37	2.0	17886	37	75	14.7	11.1	347	S	S
Lyon	6-26	42	2.5	15949	37	73	17.1	12.5	337	S-MS	HR
Hazel ^d	6-27	35	2.1	14655	41	78	17.4	13.5	477	HR	S
Steele	6-27	43	2.0	14868	41	76	17.2	13.0	457	HR	MS
Moore	6-28	41	2.3	18922	38	74	15.7	11.7	368	R-MR	MS
Proat	6-29	39	2.2	16095	41	75	19.2	14.3	460	MS	R

^aDoes not include Stephen and Roseau. ^b1 = erect, 5 = flat. ^cHR = highly resistant, R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. ^d1985-86.

DURUM WHEAT

RECOMMENDED VARIETIES

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

Lloyd—Awed, midseason to late, semidwarf and good lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield and low test weight with low seed weight. Superior quality for export market. Released by North Dakota Agricultural Experiment Station in 1983.

Monroe—Awed, early, medium height and fair lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield and medium test weight with high seed weight. Superior quality for export market. Released by North Dakota Agricultural Experiment Station in 1985.

Vic—Awed, 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.

OTHER VARIETIES

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

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

Table 16. Characteristics of durum wheat varieties, 1984-86

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	37	29	1.7	S	R	14,000	59.1	57	43	59	51
Lloyd	36	28	1.6	MS	R	13,300	57.7	56	48	63	54
Monroe	33	36	1.9	MS	R	11,000	59.9	66	48	57 ⁵	55
Vic	35	37	2.0	MS	R	11,700	60.7	62	48	57	54
Mindum	39	46	4.4	MS	S	12,600	61.3	63	40	35	45
Rugby	35	37	1.8	MS	R	11,700	60.7	68	44	53	53
Ward	35	38	2.2	MR	R	11,800	60.3	65	44	52	52
LSD 5%								12	7	8	7

¹ 1 = erect, 9 = flat.
³ 1984-85.

² Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible.
⁴ 1984, 1986. ⁵ 1986. Data adjusted 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

Era—Released by Minnesota Agricultural Experiment Station in 1970. Awed, 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.

Guard—Released by South Dakota Agricultural Experiment Station in 1983. Variety protection pending. Awed, 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.

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

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

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

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

OTHER VARIETIES

Butte—Released by North Dakota Agricultural Experiment Station and USDA-ARS in 1977. Awned, early, medium height. Resistant to stem rust. Tolerant of loose smut and ergot. Medium yield and high test weight. Medium protein percent. Satisfactory milling and baking characteristics. Because of early heading, may be suitable for later seeding. Disadvantages—Susceptible to leaf rust and to black chaff. Moderately susceptible to tan spot and lodging. Very tough threshing.

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

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



USDA cereal rust scientist D. V. McVey, right, and a visitor evaluating wheat plots on the University of Minnesota's St. Paul campus. The fight against cereal rust, done in conjunction with the federal government, goes back to the early days of the century-old Agricultural Experiment Station.

Table 17. Yields of hard red spring wheat varieties in bushels per acre, 1984-86

Variety	Crookston	Stephen ¹	Roseau	Northern average	St. Paul	Morris	Lamberton	Waseca	Southern average	State average
Publicly developed varieties										
Era	54	56	50	53	52	47	49	56	51	52
Guard	52	51	46	50	52	50	48	65	54	52
Len	49	47	40	45	51	45	45	57	49	47
Marshall	54	54	46	51	52	49	50	63	54	53
Stoa	63	53	51	56	50	54	49	67	55	56
Wheaton	58	58	47	54	54	55	54	68	58	56
Butte	49	48	45	47	48	44	43	56	48	48
Chris	42	41	37	40	33	39	37	44	38	39
Olaf	51	48	42	47	51	44	46	55	49	48
Privately developed varieties										
Apex 83	55	45	47	49	55	44	45	60	51	50
A99AR	54	53	59	55	46	50	46	63	51	53
Buckshot	53	54	44	50	51	45	48	61	51	51
Celtic	60 ²	51 ³	48 ²	53	56 ²	45 ²	48 ²	63 ²	53 ²	53 ²
Challenger	50	46	46	47	54	45	42	60	50	49
Erik	58	62	42	54	44	49	53	70	54	54
Leif	43 ⁴	54 ⁵	40 ⁴	46 ⁴	51 ⁴	41 ⁴	44 ⁴	64 ⁴	50 ⁴	48 ⁴
Norak	55 ²	46 ³	42 ²	48 ²	52 ²	43 ²	43 ²	58 ²	49 ²	49 ²
Norseman	60	51	45	52	53	46	48	64	53	53
Oslo	56	48	45	50	56	47	44	60	52	51
Solar	53	56	44	51	51	45	50	59	51	51
Success	56	58	49	54	52	50	50	61	53	54
Tammy	57 ²	37 ³	50 ²	48 ²	55 ²	48 ²	41 ²	64 ²	52 ²	50 ²
Walera	51	49	42	47	44	43	49	54	47	47
2369	57	54	49	53	53	48	50	63	54	54
LSD 5%	9	6	7	6	9	7	6	9	4	4

¹ 1984, 1986. ² 1985-86. ³ 1986. ⁴ 1984-85. ⁵ 1984. Data adjusted to 3-year average.

PRIVATELY DEVELOPED VARIETIES

Apex 83—First marketed by SeedTec in 1983. Seed sale regulated by U.S. Variety Protection Act. Awned, early, semidwarf. Resistant to stem 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.

A99AR—Released by Weather Master in 1982. Seed sale regulated by U.S. Variety Protection Act. 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.

Buckshot—First marketed by Arrowhead in 1983, now Discount Farm Center. Seed sale regulated by U.S. Variety Protection Act. 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.

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

Challenger—Released by Western Plant Breeders in 1983. Seed sale regulated by U.S. Variety Protection Act. Awned, early, semidwarf. Moderately susceptible to stem 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.



USDA wheat breeder Robert Busch examines Marshall wheat in a plot. More than 70 percent of the hard red spring wheat acreage in Minnesota was planted to Marshall, which was released in 1982.

Erik—First marketed by Agripro in 1983. Seed sale regulated by U.S. Variety Protection Act. Awned, late to midseason, semidwarf. Resistant to stem and leaf rust. Good lodging resistance. Very high yield and medium test weight. Low to medium protein percent. Disadvantages—Moderately susceptible to loose smut and mildew.

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

Table 18. Characteristics of hard red spring wheat varieties, 1984-86

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									
Era	29	31	2.0	MR	R	15,900	60	12.5	low-med.
Guard	24	31	2.0	R	MS	13,300	61	13.3	med.
Len	27	31	1.6	R	R	13,700	60	14.1	high-med.
Marshall	28	30	1.6	MR	R	14,500	61	12.8	med.-low
Stoa	25	37	2.0	MR	R	14,000	60	13.8	med.-high
Wheaton	26	30	2.2	R	R	13,000	59	12.6	low-med.
Butte	23	34	2.7	S	R	14,300	61	13.7	med.-high
Chris	28	38	4.2	MS	MS-MR	15,000	60	14.8	v. high
Olaf	27	32	1.7	R	R	13,400	60	14.1	med.-low
Privately developed varieties									
Apex 83	23	30	2.0	MR	R	12,400	60	13.0	low-med.
A99AR	28	40	2.8	MR	MS	10,900	60	13.2	low
Buckshot	27	32	1.9	MS	R	12,600	60	13.2	med.
Celtic	25	32	2.0	R	R	13,000	61	13.6	med.
Challenger	23	30	2.0	R	MS-S	12,500	61	12.9	low-med.
Erik	29	32	1.8	R	R	14,000	60	12.7	med.-low
Leif	26	34	2.0	R	R	12,500	61	12.8	low-med.
Norak	28	30	2.0	R	MR	13,000	60	12.8	low
Norseman	27	30	1.2	R	R,S	13,000	59	13.3	med.-low
Oslo	23	29	1.7	MS	MS	12,800	59	12.6	low
Solar	29	31	2.1	MR-MS	R	14,600	60	12.5	low-med.
Success	30	34	2.3	R	R	12,600	60	12.6	low-med.
Tammy	28	32	2.0	R	MS	12,800	59	13.3	med.-low
Walera	30	30	2.0	MR	R	14,500	60	12.5	low
2369	26	31	2.2	MS	MR	12,900	61	13.0	low-med.

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

Norak—First sold by SeedTec in 1985. Seed sale regulated by the U.S. Variety Protection Act. Awned, midseason, semidwarf. Resistant to leaf rust and moderately resistant to stem rust. Medium yield. Low to medium protein percent. Disadvantages—Low water absorption.

Norseman—First marketed by Agripro in 1984. Seed sale regulated by U.S. Variety Protection Act. Awned, midseason, semidwarf. Resistant to leaf rust. Good lodging resistance. Very high yield. Low to medium protein percent. Disadvantages—Low bake absorption and mixed resistant-susceptible to stem rust. Low test weight.

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

Solar—First marketed by Agsco in 1977. Seed sale regulated by U.S. Variety Protection Act. Awned, late to midseason, semidwarf, similar to Era. Resistant to stem rust and moderately resistant to leaf rust. Tolerant of loose smut and ergot. Medium lodging resistance. High yield and medium test weight. Low protein percent.

Satisfactory milling. Disadvantages—Low bake absorption. Because of later maturity, less suitable for late seeding in southern Minnesota.

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

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

Walera—First marketed by Agsco in 1980. Seed sale regulated by U.S. Variety Protection Act. Awned, late, semidwarf. Resistant to stem rust and moderately resistant to leaf rust. Moderately tolerant to loose smut and ergot. Medium lodging resistance. Medium yield and test weight. Low protein percent. Satisfactory milling. Disadvantages—Low bake absorption.

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

WINTER WHEAT

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

RECOMMENDED VARIETIES

Rose—Awned, medium height, winterhardy, medium maturity and good lodging resistance. 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, winterhardy, medium maturity and fair lodging resistance. 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.

OTHER VARIETIES

Agassiz—Awned, tall, winterhardy, medium maturity and fair lodging resistance. 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, winterhardy semidwarf with good lodging resistance. 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. Seed sale regulated by U.S. Variety Protection Act.

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

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, 1984-86

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	9	39	86	2.2	S	MS	62.2	41	52	63	57	50
Roughrider	10	43	94	3.6	S	R	61.1	36	52	54	49	46
Agassiz	12	46	92	3.6	S	R	60.4	33	50	50	36	42
Bighorn	8	35	92	2.0	S	S	58.6	47 ⁵	54 ⁵	73	—	—
Brule	8	38	83	2.5	MS	R	59.2	40	58	67	63	53
Minter	14	45	97	5.3	MS	R	60.6	33	49	48	36	41
Norstar	14	47	92	4.5	S	S	60.4	34	50	51	42	43
Siouxland	4	39	78	3.0	R	R	59.2	42 ⁵	56 ⁵	75	—	—
LSD 5%									4	16	10	5

¹1 = erect, 9 = flat. ²Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. ³1986. ⁴1984. ⁵1985-86. 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

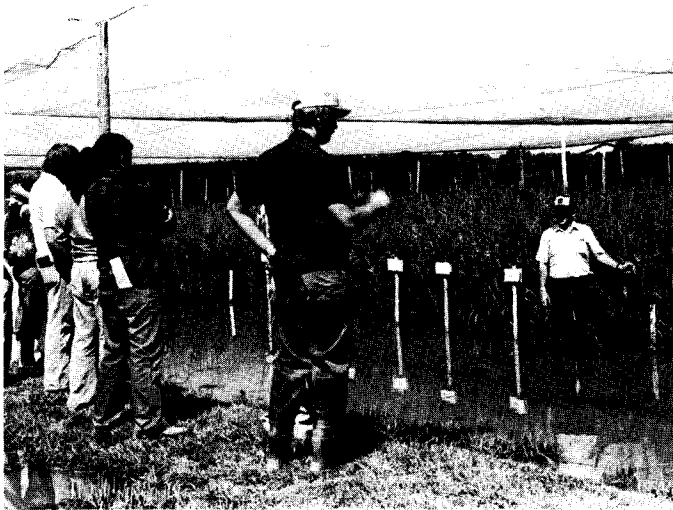
K2—Medium height, early to medium maturity, and medium to high yield. Developed by Kosbau Bros. in 1972.

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

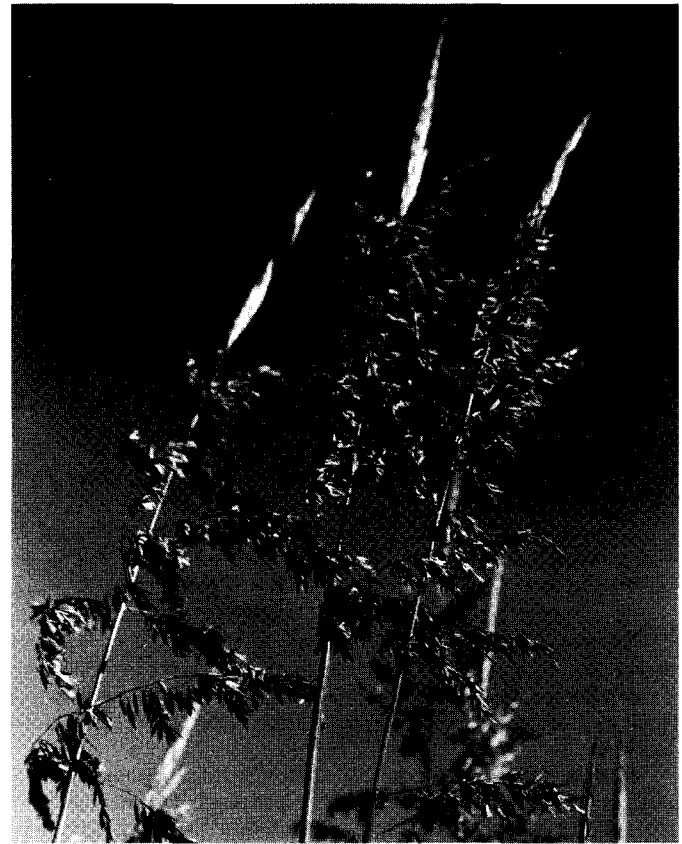
Meter—Short height, very early maturity and reduced foliage in the canopy compared to other varieties. Large seed size and low to medium yield. Developed by Minnesota Agricultural Experiment Station and released in 1985.

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



Agronomist Robert Stucker, in a wild rice paddy, speaks to visitors at Grand Rapids. Research developing non-shattering wild rice has made this traditional crop much more valuable commercially.



The spear-like stalks of wild rice tend to shatter, but research has created several nonshattering varieties more suited to cultivation.

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.

²1986 data from Grand Rapids and Rosemount.

³1986 data from Grand Rapids

only. ⁴Seeds per pound based on wet, stored seed.

WINTER RYE

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

RECOMMENDED VARIETIES

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

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

Rymin—High yield, fair winterhardiness, medium late, medium height. Good lodging resistance. Large seed of predominantly greenish-gray color and high test weight. Originated by Minnesota Agricultural Experiment Station from a cross of Von Lochow and WR5. Released in 1973.

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 winterhardiness, late, medium height, and good lodging resistance. Very large seed of predominantly green color and high test weight. Developed by Dankow-Laski and Choryn experiment stations and is reported to be the leading variety in Poland. Seed distributed by Northern Farm and Garden Inc. at Bemidji, MN 56601 and at Roseau, MN 56751.

Frederick—Medium yield, good winterhardiness, medium late, medium height, and poor lodging resistance. Medium size seed of predominantly tan color and high test weight. Selected from Von Lochow by South Dakota Agricultural Experiment Station. Released in 1984.

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

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

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

Variety	Rosemount 1981-85	Becker 1982-85	Morris 1982-86	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. ³1982-83, 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.

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.

VARIETIES NOT ADEQUATELY TESTED

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

OTHER VARIETIES

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

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

Flor—Medium yield. Medium maturity, brown seed, blue flowers. High oil percent. Resistant to rust, susceptible to wilt, moderately susceptible to pasmo. Released in 1981 by North Dakota Agricultural Experiment Station.

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

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

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 in bushels per acre

Variety	Lamberton 1981-85	Crookston 1981-85	Stephen 1981-85	Roseau 1984-85	Grand Rapids 1984-85	St. Paul 1981-84	Morris 1982-83	Average 25 trials
Dufferin	25	16	15	15	31	19	34	20.7
Rahab	26	17	14	18	31	18	34	20.7
Clark	23	15	13	16	27	17	33	18.9
Culbert	24	14	13	17	26	18	33	19.1
Culbert 79	24 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 (percent) ¹	Test weight/ bushel (pounds)	Seeds/ pound (number)	Planting to bloom		Lodging (score) ²	Height (inches)	Disease reaction		
				first (days)	full (days)			Wilt (score) ³	Pasmo (score) ³	Rust (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
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 new crop developed from oilseed rape by Canadian agronomists. The first canola variety was licensed in 1974. Canola seed oil contains less than 2 percent of erucic acid compared with 20 to 40 percent in rape varieties formerly grown for food oil. Furthermore, the protein meal remaining after oil extraction contains less than 0.1 percent of glucosinolate sulfur compounds compared with

about 1 percent in rapeseed meal. High levels of erucic acid in food oils are now considered hazardous to health, and high levels of glucosinolates are detrimental in livestock feeds. Consequently, canola is replacing oilseed rape for food oil and livestock feed.

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

VARIETIES

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

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

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

Tilney—Yellow mustard. Similar to Kirby in field performance but has a high mucilage content desired by processors. Released by Colman Foods of Norwich, England in 1978. Distributed by Minn-Dak Growers Association, Grand Forks, ND.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

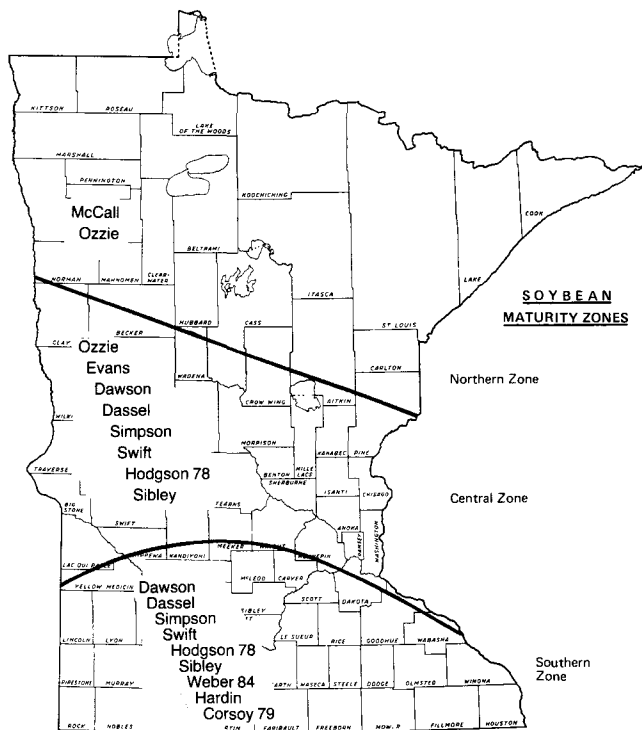
¹Oven-dry basis. ²1 = erect, 9 = flat. ³1985. (1977-78 Rosemount). ⁴1982-85. ⁵1985. ⁶1984-85. ⁷1983-85. ⁸1982-85.

SOYBEAN

Many different soybean varieties are available in Minnesota. These varieties have been developed by public and/or private organizations. The important characteristics of these soybean varieties are presented in the following tables. Tables 26 to 32 deal with those varieties that were developed by publicly supported institutions and are being considered for recommendation by Minnesota Agricultural Experiment Station. Tables 33 to 35 show performance characteristics of privately developed varieties as well as several public varieties. Recommendations are not made for these private varieties because they are voluntarily submitted by the 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 the date of maturity is affected by production zone latitude. Because of this, each soybean variety has a narrow range of adaptation. Varieties that mature before the fall killing frost should be selected to obtain high yield and quality. A soybean variety is considered mature when 95 percent of the pods have reached their mature color. Harvesting would normally be done 1 to 2 weeks after this stage is reached, depending on drying conditions. The accompanying map relates production zones to the recommended varieties discussed in the text and tables.



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

ROW SPACING—Research conducted over many years and many locations has shown that yields in narrow rows (10 inches to 18 inches) are higher than wide rows (20 inches to 40 inches). With few exceptions varieties perform better in narrow rows than in wide rows. 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 values may vary from year to year. A good way to use these values is to compare scores of newer varieties to scores of a familiar variety.

PHYTOPHTHORA—Phytophthora root rot can cause significant yield losses in susceptible varieties exposed to wet weather and poorly drained fields. Since there are numerous races of this fungus, it is important to know which are present in a particular situation. The phytophthora reactions listed in the tables were determined on greenhouse-grown plants by the University of Minnesota's Department of Plant Pathology and from information supplied by companies. These reactions are only to phytophthora races 1, 3 and 4.

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.

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

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

RECOMMENDED VARIETIES:

Corsoy 79—Southern zone. Very similar to Corsoy, which has been the leading variety in Minnesota for several years, except that it is resistant to races 1, 2, 3, and 6 of phytophthora. 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. Resistant to races 1, 2, 3 and 4 of 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. Resistant to races 1 and 2 of phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1983. Seed sale regulated by U.S. Variety Protection Act.

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

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

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

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

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

Sibley—Central and southern zones. One day later than Hodgson 78. Higher yielding and higher protein and oil than Hodgson 78. Resistant to races 1 and 2 of 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. Resistant to races 1 and 2 of phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1982. Seed sale regulated by U.S. Variety Protection Act.

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

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

VARIETIES NOT ADEQUATELY TESTED

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

Hoyt—Matures about three days later than Corsoy 79. Good lodging resistance. Determinate variety. Resistant to races 1 and 2 of phytophthora. Developed by Ohio Agricultural Experiment Station. Released in 1986.

Keller—Similar in maturity to Corsoy 79. Similar to Beeson except it is resistant to races 1-11 and 13-18 of phytophthora. Developed by Indiana Agricultural Experiment Station. Released in 1983. Seed sale regulated by U.S. Variety Protection Act.

Maple Donovan—Slightly later than Evans in maturity. Resistant to races 1, 2, 3 and 4 of phytophthora. Developed by Agriculture Canada, Ottawa. Licensed in 1986. Production of certified seed limited to Canada.

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

Miami—Similar in maturity to Corsoy 79. Similar to Wells II except it is resistant to races 1-11 and 13-18 of phytophthora. Developed by Indiana Agricultural Experiment Station. Released in 1984. Seed sale regulated by U.S. Variety Protection Act.

OTHER VARIETIES

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

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

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

Corsoy—A leading variety in Minnesota for many years. Now largely superseded by phytophthora-resistant backcross deriva-



Harlan Ford, an agronomist at the Southwest Experiment Station at Lambert, examines soybean plants. Agricultural Experiment Station research has enabled the development of increasingly hardy soybeans and thus fostered the dramatic increase of acreage of this valuable plant during the past several decades.

tives. Developed by Iowa Agricultural Experiment Station. Released in 1967.

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

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

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

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

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

Maple Arrow—Matures about 6 days later than McCall. Resistant to races 1, 2, 3 and 4 of 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 Presto—Matures 12 days earlier than McCall. May be too early for high yields in Minnesota. Resistant to races 1 and 2 of phytophthora. Developed by Agriculture Canada, Ottawa. Licensed in 1979. Production of certified seed limited to Canada.

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

Weber—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.

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

PRIVATELY DEVELOPED VARIETIES

The private companies entering varieties in the 1986 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); Cenex, Box 64089, St. Paul, MN 55164-0089 (Cenex); Challenger Seed Ltd., P.O. Box 747, Cedar Falls, IA 50613 (Challenger); Dairyland Seed Company, Inc., P.O. Box 958, West Bend, WI 53095 (Dairyland); DeKalb-Pfizer Genetics, 3100 Sycamore Road, DeKalb, IL 60115 (DeKalb); Diamond Brand Seeds, 1127 Plaza Drive, Carrol, IA 51401 (Diamond Brand); Domestic Seed and Supply, Inc. Box 466, Madison, SD 57042 (Mustang Brand) 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 61701 (Funk); Green Field Seed, P.O. Box 56, Comfrey, MN 56019 (GFS); 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); Hyland Seeds, Box 130, Blenheim, Ontario, Canada NOP IAO (Hyland); Hy-Vigor Seeds, Inc., Route 1, Box 77, Paullina, IA 51046 (Hy-Vigor); Inter state Seed Company, Box 470, 417 Main Ave., Fargo, ND 58107 (Interstate); Jacques Seed Company, 720 St. Croix St., Prescott, WI 54021 (Jacques); Kaltenberg Seed Farms, Inc., 5506 Hwy 19 Box 278 Route 2, Waunakee, WI 53597 (Kaltenberg); King Grain, Inc., P.O. Box 1088, Chatham, Ontario, N7M 5L6 Canada (King Grain); Kruger Seed Company, Hwy 57 East, P.O. Box A., Dike, IA 50624 (Kruger, DeSoy); Land O'Lakes, Inc., 2827 8th

Ave. S., Fort Dodge, IA 50501 (Land O'Lakes); Latham Brothers Farms, Rt. 1, Box 12, Alexander, IA 50420 (Latham); Latham Seed Company, Rt. 1, Box 12, Alexander, IA 50420 (Latham); Lynks Seeds, P.O. Box 637, Marshalltown, IA 50158 (Lynks Seeds); Lynnville Seed Company, Lynnville, IA 50153 (Riverside); Midwest Oilseeds, Route 3, Box 204, Adel, IA 50003 (Midwest Oilseeds); Northrup King Company, 1500 Jackson St. N.E., Minneapolis, MN 55440 (Northrup King); Payco Seeds, P.O. Box 70, Dassel, MN 55325 (Payco Select); Pioneer Hi-Bred Intl., Inc., 7000 Pioneer Parkway, Johnston, IA 50131 (Pioneer); Pride Company, Inc., RFD Box 58, Glen Haven, WI 53810 (Pride); ProfiSeed Inc., Route 2, Hampton, IA 50441 (ProfiSeed); J.C. Robinson Seed Co., N. Hwy. 64, Waterloo, NE 68069 (Golden Harvest); Rossbach Lakeside Seeds, Route 1, Hanska, MN 56041 (Lakeside); Sand Seed Service, Inc., P.O. Box 648, Marcus, IA 51035 (SOI); Schechinger Seed Company, Route 1, Harlan, IA 51537 (S-Brand); Seedex, 580 W. Conner St., P.O. Box 770, Noblesville, IN 46060 (Seedex); SeedTec, Box 5692, Fargo, ND 58105 (SeedTec); The Sexauer Company, P.O. Box 58, Brookings, SD 57006 (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 Seed Co., 600 4th St., Sioux City, IA 51101 (Terra Seed); Thompson Farms Seeds, Route 1, Leland, IA 50453 (Thompson); Willette Seed Farm, Inc., Delavan, MN 56023 (Willette Seed Farm); Wilson Hybrids, Inc., P.O. Box 391, Harlon, IA 51537 (Wilson Blend®); Ziller Seed Company, Route 1, P.O. Box 122, Bird Island, MN 55310 (Ziller).

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

Variety	Crookston 1982-86	Grand Rapids 1982-86	Moorhead 1982-86	Roseau 1982-86
Maple Presto	24	24	39 ⁴	28
Maple Ridge	30 ⁴	27 ²	42 ⁴	26 ²
Maple Isle	26 ⁴	32 ⁴	41 ⁴	20 ³
Maple Amber	28	27	31	24
McCall	33	35	33	31
Bicentennial	31 ⁴	27 ²	47 ⁴	—
Chico	26	—	35	—
Clay	32	28	38	26
Ozzie	30 ¹	—	39	—
Evans	28 ¹	—	38	—
Dawson	29 ⁴	—	37	—
Dassel	—	—	49 ⁴	—
Simpson	—	—	39	—
LSD (5%)	3	3	3	4

¹1983-86. ²1984-86. ³1985-86. ⁴1986.

Table 27. Yields of publicly developed soybean varieties in 10 inch and 30 inch spacings, and three planting dates at Morris in bushels per acre, 1986.

Variety	mid-May planting		late-May planting		mid-June planting	
	10 inch	30 inch	10 inch	30 inch	10 inch	30 inch
McCall	—	—	49	38	38	28
Ozzie	58	49	60	42	26	25
Evans	66	50	65	46	32	38
Dawson	—	—	65	46	31	33
Swift	66	51	—	—	—	—
Hodgson 78	63	52	—	—	—	—
LSD 5%	7	7	7	7	7	7

Table 28. Yields of publicly developed soybean varieties in central zone in bushels per acre.

Variety	Rosemount	Morris	Becker	Average
	1983-86 10-inch	1983-86 10-inch	1983-86 30-inch	1983-86
McCall	41	40	—	40
Clay	40	42	41 ¹	41 ²
Ozzie	45	44	44	44
Evans	43	46	43	44
Dawson	45	48	46	46
Dassel	44	46	46	45
Simpson	48	47	46	47
Swift	39	48	44	44
Hodgson 78	47	47	46	47
LSD 5%	4	4	3	2

¹1983 data only. ²1983-1986 Rosemount and Morris data, 1983 Becker data.

Table 29. 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.

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	—	—	—	—	—	—	43	40	29	28
Simpson	—	—	—	—	—	—	40	40	27	30
Sibley	59	53	58	53	50	45	42	40	29	28
Hardin	60	61	59	57	52	50	46	40	26	25
Corsoy 79	52	52	57	54	46	45	—	—	—	—
BSR 101	60	58	60	56	51	47	—	—	—	—
LSD 5%	4	4	4	4	4	4	4	4	4	4

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

Variety	Waseca and Lamberton		Fairmont	Waseca	Lamberton	Average
	mid-May ¹ planting 1983-86	mid-June ¹ planting 1983-86	mid-May planting 1983-86 30-inch	mid-May planting 1983-86 10-inch	mid-May planting 1983-86 10-inch	mid-May planting 1983-86
McCall	—	32	—	—	—	—
Clay	—	28	—	—	—	—
Ozzie	50 ²	36	42	44 ²	56 ²	47 ³
Evans	50 ²	36	42	45 ²	55 ²	47 ³
Dawson	52 ²	39	44	48 ²	58 ²	50 ³
Dassel	54 ²	—	43	52 ²	56 ²	50 ³
Simpson	54 ²	36	44	48 ²	60 ²	51 ³
Swift	49 ²	—	42	44 ²	56 ²	47 ³
Hodgson 78	48	36	49	48	54	50
Sibley	51	—	47	51	54	51
Weber 84	50	38	50	51	54	52
Hardin	54	38	51	55	59	55
BSR 101	56 ²	42 ²	54 ²	52 ²	60 ²	55 ²
Vickery	51	—	50	50	55	52
Corsoy 79	48	34	48	46	56	50
Elgin	48	—	46	47	52	48
BSR 201	48	40 ²	50	48	52	50
Hack	58 ²	—	52	54 ²	63 ²	56 ²
LSD 5%	2	2	2	3	3	2

¹1983-84 30-inch, 1985-86 10-inch. ²1985-86 data. ³1983-86 data Fairmont, 1985-86 data Lamberton and Waseca.

Table 31. Field characteristic of publicly developed soybean varieties, 1986

Variety	Mature		Lodging (score) ³	Height (inches)	Phytophthora (reaction) ⁴	Powdery mildew (reaction) ⁶	Chlorosis (score) ³
	mid-May Planting (days after August 31)	mid-June Planting					
Northern Zone (Crockston and Moorhead)							
Maple Presto	-6	—	1.3	27	R	S	5.0
Maple Ridge	0	—	1.3	29	S	S	2.0
Maple Isle	2	—	1.1	31	S	S	4.0
Maple Amber	6	—	1.8	34	R ⁵	S	5.0
McCall	10	—	2.1	35	S	S	4.0
Chico	14	—	2.0	37	R	R	3.8
Clay	14	—	1.8	33	S	S	3.5
Maple Arrow	18	—	2.6	38	R	S	5.0
Ozzie	19	—	1.8	38	R	S	2.0
Bicentennial	20	—	2.0	39	R	S	4.0
Evans	21	—	2.6	40	R	R	2.8
Maple Donovan	23	—	2.9	40	R ⁵	—	4.0
Dawson	23	—	3.0	41	R	S	2.2
Dassel ^{1,2}	26	—	2.0	38	R ⁵	R	3.5
Simpson ^{1,2}	27	—	2.7	41	R	S	3.2
Central Zone (Morris and Rosemount)							
McCall	5	—	2.0	37	S	S	4.0
Chico	13	—	2.3	35	R	S	3.8
Clay	14	—	2.5	34	S	S	3.5
Ozzie	15	38	2.2	37	R	S	2.0
Evans	18	32	2.5	41	R	R	3.0
Maple Donovan	19	—	3.0	40	R ⁵	—	4.0
Dawson	19	40	3.1	38	R	S	2.2
Dassel	23	—	2.5	34	R ⁵	R	3.5
Simpson	25	—	3.1	41	R	S	3.2
Swift	25	—	3.5	43	S	R	2.0
Hodgson 78	26	—	3.1	41	R	S	2.8
Sibley	31	—	3.2	43	R	S	4.0
Weber 84 ⁷	34	—	—	—	R	R	1.5
Hardin ⁷	35	—	—	—	R	S	4.0
Vickery ⁷	38	—	—	—	R ⁵	S	5.0
Corsoy 79 ⁷	38	—	—	—	R ⁵	S	4.5
Southern Zone (Lamberton and Waseca)							
McCall	—	17	1.3	26	S	S	4.0
Clay	—	22	1.7	27	S	S	3.5
Ozzie	4	24	1.0	32	R	S	2.0
Evans	4	25	1.2	35	R	R	3.0
Dawson	7	27	2.0	34	R	S	2.0
Dassel	10	29	1.5	34	R ⁵	R	3.5
Simpson	12	28	2.7	34	R	S	3.2
Swift	13	28	3.0	39	S	R	2.0
Hodgson 78	19	31	2.3	39	R	S	2.8
Sibley	22	33	2.7	40	R	S	4.0
Weber 84	23	34	3.7	43	R	R	1.5
Hardin	23	33	3.5	43	R	S	4.0
BSR 101	25	37	2.3	43	R	R	3.0
Vickery	27	—	3.7	45	R	S	5.0
Corsoy 79	28	37	3.0	49	R	S	4.5
Elgin	28	40	3.2	38	S	R	4.0
BSR 201	30	38	3.3	42	R	R	5.0
Hack	30	—	1.8	42	R	S	5.0

¹Moorhead only. ²Not mature at killing frost. ³1 = excellent 5 = very poor.

⁴R = resistant, S = susceptible to races 1 and 2. ⁵Also resistant to race 3. ⁶R = resistant,

S = susceptible. ⁷Not grown at Morris or Rosemount shown here for comparative purposes only.

Table 32. Plant characteristics of publicly developed soybean varieties, 1986.

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 Presto	P	T	G	2670	2.0	39.4	18.9
Maple Ridge	P	T	Y	2892	2.0	39.8	17.5
Maple Isle	P	T	Br	2340	2.3	39.4	18.3
Maple Amber	P	T	Br	2686	1.7	41.0	18.7
McCall	P	G	Y	2929	1.3	39.9	17.2
Chico	W	G	Bf	3492	1.2	40.6	20.9
Clay	P	G	Y	2494	1.3	40.4	20.8
Maple Arrow	P	T	Br	2820	2.3	40.2	18.4
Ozzie	P	G	Y	2655	2.7	40.9	20.2
Bicentennial	P	T	Br	2364	2.0	41.0	17.2
Evans	W	G	Y	2735	1.3	37.0	19.9
Maple Donovan	P	G	Bf	2986	1.3	37.6	20.0
Simpson ¹	P	G	Bf	3243	1.3	38.8	18.6
Dawson ¹	P	G	Y	2967	1.3	36.9	19.2
Central Zone (Morris and Rosemount)							
McCall	P	G	Y	2929	1.3	39.9	17.2
Chico	W	G	Bf	3492	1.2	40.6	20.9
Clay	P	G	Y	2494	1.3	40.4	20.8
Ozzie	P	G	Y	2655	2.7	40.9	20.2
Evans	W	G	Y	2686	2.3	40.0	20.4
Dawson	P	G	Y	2929	3.3	39.4	19.3
Simpson	P	G	Bf	2855	2.3	40.5	19.6
Dassel	P	G	Y	2565	3.0	40.7	19.4
Swift	W	T	Bl	2752	2.0	39.1	18.8
Hodgson 78	P	G	Bf	2873	2.0	39.4	19.4
Sibley	W	G	Y	2340	2.7	40.4	19.5
Weber 84 ⁷	W	T	Bl	3439	2.0	38.7	19.7
Hardin ⁷	P	G	Y	2987	2.5	38.7	20.4
Vickery ⁷	P	G	Y	2838	1.7	39.6	18.9
Corsoy 79 ⁷	P	G	Y	2785	2.5	39.3	19.0
Southern Zone (Lamberton and Waseca)							
McCall	P	G	Y	2892	3.7	37.9	18.9
Clay	P	G	Y	2768	3.0	39.7	20.2
Ozzie	P	G	Y	2735	2.0	39.3	19.8
Evans	W	G	Y	2785	2.7	38.5	21.4
Dawson	P	G	Y	2910	2.2	37.5	20.6
Dassel	P	G	Y	2508	3.3	38.5	21.3
Simpson	P	G	Bf	2967	3.0	38.2	20.1
Swift	W	T	Bl	2768	2.7	37.2	20.4
Hodgson 78	P	G	Bf	2838	3.0	38.6	21.6
Sibley	W	G	Y	2340	2.7	38.5	21.1
Weber 84	W	T	Bl	3439	2.0	38.7	19.7
Hardin	P	G	Y	2987	2.5	38.7	20.4
BSR 101	P	G	lb	2640	2.0	38.1	19.6
Vickery	P	G	Y	2838	1.7	39.6	18.9
Corsoy 79	P	G	Y	2785	2.5	39.3	19.0
Elgin	P	T	Bl	2609	1.7	38.0	18.8
BSR 201	W	G	Bf	2929	1.9	39.8	18.8
Hack	W	G	Bf	2594	1.7	38.8	19.8

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 33. Yields and characteristics of public and private soybean varieties, northern zone, 1986 (Crookston, Moorhead, Morris)

Brand or Originator	Variety	Mature (days after August 31)	yield/acre (bushels)			Lodging (score) ²	Height (inches)	Phytophthora (reaction) ³	Chlorosis (score) ²
			1986	1985-86	1984-86				
Agric. Canada	Maple Presto	-6	29	27	23	1.3	27	R	5.0
Sigco	Comet	-1	40	—	—	1.9	29	M	2.0
Agric. Canada	Maple Ridge	0	37	37	—	1.3	29	S	2.0
Hyland	Baron	1	37	—	—	1.8	32	R	3.0
King Grain Inc.	KG20	2	42	39	—	2.0	34	S	2.0
Agric. Canada	Maple Isle	2	34	34	—	1.1	31	M	4.0
Agric. Canada	Maple Amber	6	38	37	32	1.8	34	R ⁴	5.0
Minn. A.E.S.	McCall	10	42	41	39	2.1	35	S	4.0
Minn. A.E.S.	Clay	14	42	38	37	1.8	33	S	3.5
Minn. A.E.S.	Chico	14	40	35	35	2.0	37	R	3.8
Jacques Seed Co.	011 ¹	16	45	—	—	1.9	35	S	2.0
King Grain Inc.	KG31	17	41	40	—	2.0	40	S	2.0
Profiseed Inc.	PS 811	18	45	42	—	2.6	39	S	2.0
Hyland	Apache	18	42	—	—	1.7	37	R	4.0
Jacques Seed Co.	74 ¹	18	41	—	—	1.7	38	R	5.0
Agric. Canada	Maple Arrow	18	39	35	33	2.6	38	R	5.0
King Grain Inc.	KG30	19	45	42	—	2.7	41	S	2.0
Interstate	604	19	44	—	—	2.2	40	S	4.0
Minn. A.E.S.	Ozzie	19	42	40	39	1.8	38	R	2.0
Dairyland	DSR-066	19	40	—	—	3.3	39	R ⁴	4.0
SeedTec	401	19	37	—	—	2.5	44	S	3.0
Stine	0510	20	42	37	38	2.9	38	S	3.0
University of Guelph	Bicentennial	20	41	37	—	2.0	39	R	4.0
Northrup King	S 0512	20	39	34	34	3.2	44	S	2.0
SeedTec	390	20	36	—	—	2.1	41	S	4.0
Land O'Lakes	X 0700	21	45	—	—	3.3	46	M	4.0
Minn. A.E.S.	Evans	21	42	36	37	2.6	40	R	2.8
SeedTec	350-B ¹	21	42	—	—	1.9	40	S	2.0
Agric. Canada	Maple Donovan	23	46	—	—	1.9	40	R ⁴	4.0
King Grain Inc.	KG60	23	46	—	—	2.0	36	S	3.0
Pioneer	9061	23	45	—	—	2.4	42	R	4.0
Minn. A.E.S.	Dawson	23	43	—	—	3.0	41	R	2.2
Hyland	Marathon	25	40	—	—	2.8	44	R	4.0
Land O'Lakes	X 0900	26	39	—	—	2.8	45	M	2.0
Agripro	AP120	26	36	—	—	2.9	43	R	5.0
The Sexauer Co.	SX 1010	27	38	—	—	3.8	48	R	3.0
LSD 5%			4	3	2				

¹Blend (information supplied by originator). ²1 = excellent, 5 = very poor. ³R = resistant, S = susceptible, M = mixture of R & S to races 1 & 2. ⁴Also resistant to race 3 and race 4.

Table 34. Yields and characteristics of public and private soybean varieties, central zone, 1986 (Becker, Morris, Rosemount)

Brand or Originator	Variety	Mature (days after August 31)	yield/acre (bushels)			Lodging (score) ²	Height (inches)	Phytophthora (reaction) ³	Chlorosis (score) ²
			1986	1985-86	1984-86				
Minn. A.E.S.	Ozzie	15	41	39	39	2.2	37	R	2.0
Ziller	Exp. 33	16	40	—	—	2.7	37	R	2.0
Minn. A.E.S.	Evans	17	43	39	40	3.4	41	R	2.8
Interstate	545	18	40	—	—	3.1	37	S	2.0
Minn. A.E.S.	Dawson	19	45	40	—	3.1	38	R	2.2
Northrup King	W106722	19	42	—	—	2.9	43	R ⁴	2.0
SeedTec	410-B ¹	20	43	—	—	2.9	40	S	4.0
Pioneer	0877	20	43	—	—	3.2	39	R	5.0
Sand Seed Service Inc.	SOI 059	21	42	40	—	3.0	42	R	2.0
Profiseed Inc.	PS922	21	42	39	—	2.9	40	R	2.0
Sigco	80	21	41	37	—	3.1	41	R	2.0
Land O'Lakes	X 1100	21	39	—	—	3.3	45	M	4.0
Stine	0650 ¹	21	38	—	—	3.0	39	R	3.0
Northrup King	S 09-90	22	46	41	43	2.8	42	R	4.0
Kaltenberg	KB016	22	45	40	—	2.9	42	R	2.0
Asgrow	A0949	22	43	—	—	3.3	42	R	3.0
Payco Seed Co. Inc.	PS0015	22	43	39	—	3.2	42	R	3.0
Interstate	546	22	42	39	—	3.0	40	R	2.0
DeKalb	CX096	22	41	—	—	3.0	42	R	3.0
Hofler	EXP. 1986-1	22	40	—	—	3.0	40	R	2.0
Land O'Lakes	X 0900	22	40	—	—	2.7	41	M	2.0
Payco Seed Co. Inc.	PS0010	22	40	—	—	3.0	41	R	2.0
Agripro	AP120	22	40	38	41	2.9	41	R	5.0
Sand Seed Service Inc.	SOI 142	23	43	41	43	2.8	41	R	5.0
Land O'Lakes	L 1266	23	42	—	—	2.9	39	M	4.0

Table 34 (continued). Yields and characteristics of public and private soybean varieties, central zone, 1986 (Becker, Morris, Rosemount)

Brand or Originator	Variety	Mature (days after August 31)	yield/acre (bushels)			Lodging (score) ²	Height (inches)	Phytophthora (reaction) ³	Chlorosis (score) ²
			1986	1985-86	1984-86				
Minn. A.E.S.	Dassel	23	41	—	—	2.5	34	R ⁵	3.5
Dairyland	DST1103	23	40	—	—	3.2	40	S	4.0
Hyland	Crusader	24	41	—	—	3.0	40	R	4.0
Golden Harvest	X135	24	39	38	—	3.2	42	R	5.0
Jacques Seed Co.	J-82	24	38	38	41	3.4	43	S	4.0
Minn. A.E.S.	Simpson	25	45	41	42	3.1	41	R	3.2
Asgrow	A1214	25	40	39	—	3.0	43	S	3.0
Dairyland	DSR-135	25	40	39	—	2.8	40	R	2.0
Dairyland	DSR-120	25	40	39	41	2.4	38	S	5.0
The Sexauer Co.	SX 1010	25	39	—	—	3.6	44	R	3.0
Hy-Vigor	EX 1800A ¹	25	38	—	—	3.2	41	M	5.0
Pride	B095	26	45	40	42	3.5	44	S	3.0
Pride	X609	26	45	—	—	2.5	42	S	5.0
Jacques Seed Co.	E85083	26	41	—	—	2.9	45	R	2.0
Dairyland	DSR-128	26	40	39	—	2.4	39	R ⁴	3.0
Ziller	Exp. 32	26	40	—	—	2.6	37	S	5.0
Minn. A.E.S.	Hodgson 78	26	39	38	41	3.1	41	R	2.8
Midwest Oilseeds	1820	27	46	—	—	2.3	39	S	4.0
Agripro	AP1776	27	46	42	—	1.8	39	R	4.0
Funk	G3180	27	43	42	44	2.7	37	S	3.0
SeedTec	610	27	43	—	—	3.3	45	S	3.0
Cenex	8410	27	42	39	41	2.1	37	R	4.0
Thompson	T-14	27	40	—	—	2.6	37	S	4.0
The Sexauer Co.	SX 1020	27	37	—	—	3.6	45	R	3.0
DeKalb	CX134	27	35	35	39	2.7	35	S	3.0
Northrup King	S 14-60	28	44	41	43	2.5	39	S	3.0
Farmacy	Independence	28	41	39	40	2.7	37	R	3.0
Jacques Seed Co.	E85092	28	40	—	—	2.7	40	R	3.0
Pride	B152	29	45	42	44	2.5	38	R ⁴	5.0
Sand Seed Service Inc.	SOI EXP 166	29	44	—	—	2.7	39	S	4.0
Stine	1350A	29	42	42	—	2.8	41	S	4.0
Midwest Oilseeds	1560 ¹	29	41	—	—	2.8	39	M	4.0
Kaltenberg	KB115	29	41	40	41	2.5	37	R	4.0
Hofler	Opal	29	40	—	—	2.5	35	R	5.0
Soybean Research Found.	SRF EXP 164	29	36	—	—	3.7	44	R	4.0
SeedTec	600 ¹	30	44	—	—	3.6	41	S	4.0
Thompson	T-18	30	44	—	—	3.6	42	S	5.0
Pioneer	1082	30	43	—	—	3.2	48	R	2.0
SeedTec	620-B ¹	30	43	—	—	3.4	42	S	3.0
Hofler	Jade	30	42	—	—	3.4	41	S	3.0
Golden Harvest	H-1123	30	42	40	—	2.5	36	R	4.0
Hy-Vigor	Rocker 9	30	41	40	—	3.0	41	R	5.0
Funk	12283	31	47	44	—	2.4	38	S	3.0
Minn. A.E.S.	Sibley	31	43	—	—	3.2	43	R	4.0
Asgrow	A1525	31	43	39	—	2.6	43	R	3.0
Mustang	1180 ¹	32	43	—	—	3.4	43	M	5.0
King Grain Inc.	KG 81	32	38	—	—	2.6	43	R	2.0
Mustang	1280 ¹	34	44	—	—	3.2	42	M	4.0
LSD (5%)		4	3	2					

¹Blend (information supplied by originator). ²1 = excellent, 5 = very poor. ³R = resistant, S = susceptible, M = mixture of R & S to races 1 & 2. ⁴Also resistant to race 3. ⁵Also resistant to race 3 and race 4.

Table 35. Yields and characteristics of public and private soybean varieties, southern zone, 1986 (Fairmont, Lambertson, Waseca)

Brand or Originator	Variety	Mature (days after August 31)	yield/acre (bushels)			Lodging (score) ²	Height (inches)	Phytophthora (reaction) ³	Chlorosis (score) ²
			1986	1985-86	1984-86				
Minn. A.E.S.	Hodgson 78	16	55	48	46	2.7	40	R	2.8
Wilson Blend®	1650	17	50	42	—	2.1	44	R	4.0
Funks	G3180	19	55	48	—	2.8	39	S	3.0
Diamond	D140B ¹	20	52	46	—	3.7	46	M	3.0
Minn. A.E.S.	Sibley	20	50	—	—	3.1	39	R	4.0
Northrup King	S14-60	22	58	50	50	2.8	41	S	3.0
Asgrow	A1937	22	58	49	49	2.7	42	R	4.0
Cenex	8212	22	56	48	46	3.1	44	R	3.0
Lakeside	101 ¹	22	54	—	—	3.7	44	R	2.0
Land O'Lakes	L1771	22	52	—	—	2.9	41	R ⁵	5.0
Sexauer	SX1020	22	48	—	—	3.0	46	R	3.0
SeedTec	620-B	23	59	—	—	2.8	42	S	3.0
Profiseed	1152	23	58	48	49	3.3	44	R	3.0
Mustang	1280 ¹	23	57	—	—	3.3	45	M	5.0
Stine	1850	23	56	—	—	2.8	39	S	5.0
Land O'Lakes	EX 1700 ¹	23	54	—	—	3.1	40	M ⁷	3.0
Ziller	EXP 38	23	54	—	—	2.6	40	S	5.0
Hy-Vigor Seeds	901 ¹	23	52	45	46	3.6	47	R ⁴	4.0
Jacques	J201	23	52	—	—	2.8	44	R	3.0
Terra	Runner 3	24	61	—	—	2.1	40	R	4.0
Desoy	302-11 ¹	24	60	—	—	2.4	41	R ⁶	2.0
Golden Harvest	X170	24	60	—	—	2.3	41	S	2.0
Interstate	622	24	60	—	—	2.2	41	S	4.0
Latham	200	24	58	—	—	2.4	38	S	1.0
Pride	B152	24	57	—	—	2.4	40	R ⁴	5.0
Asgrow	A1525	24	56	47	—	1.8	42	R	3.0
Mustang	1180 ¹	24	53	—	—	3.3	44	M	5.0
Agripro	AP1776	25	64	—	—	2.1	44	R	4.0
Iowa A.E.S.	Hardin	25	62	52	51	3.0	45	R	4.5
Kruger	K1012	25	61	—	—	2.2	40	S	2.0
S-Brand	S-38A	25	60	—	—	2.6	39	S	4.0
Ziller	EXP 37	25	60	—	—	2.2	39	S	4.0
Profiseed	6851	25	59	—	—	2.2	40	S	4.0
Kaltenberg	KB116	25	58	—	—	2.4	40	S	3.0
Ehrich Seed Farm	E-86	25	58	—	—	2.2	42	S	2.0
Jacques	J-231	25	58	52	49	2.9	44	R	3.0
Lynks	8165	25	58	—	—	2.3	40	R	3.0
Lakeside	104 ¹	25	56	50	—	3.6	45	R	2.0
Farmacy	Enterprise II	25	54	48	47	2.9	41	S	3.0
Ehrich	E-84	25	53	48	—	2.9	43	R	3.0
Dairyland	DST 1207	25	53	—	—	2.8	41	R ⁴	5.0
Pioneer	9201	25	52	—	—	2.4	40	S	5.0
Latham	301 ¹	25	52	48	45	3.2	43	R	2.0
SOI	136	25	52	—	—	2.9	46	R	2.0
S-Brand	S-38B	25	52	—	—	2.8	38	S	5.0
Land O'Lakes	L1808	25	51	48	47	3.7	39	M	4.0
Funks	12283	26	59	—	—	2.4	38	S	3.0
Midwest Oilseeds	2500 ¹	26	59	—	—	2.4	39	M	3.0
Midwest Oilseeds	1480	26	58	51	49	2.2	39	S	3.0
Interstate	624	26	57	—	—	3.0	45	R	4.0
Northrup King	S15-50	26	57	48	—	2.6	50	R ⁴	5.0
Thompson	T-12	26	57	49	48	3.6	45	R	5.0
Northrup King	S23-12	26	57	—	—	2.4	45	S	5.0
Funks	G3145 ¹	26	56	49	48	2.8	45	R	4.0
Agripro	HP20-20	26	56	47	46	3.0	42	R	4.0
Dairyland	DSR-171	26	55	48	46	3.3	46	S	4.0
SeedTec	630	26	54	—	—	2.9	46	S	4.0
Cenex	8518	26	54	—	—	2.3	43	S	4.0
Profiseed	6931	26	54	—	—	3.0	46	R	4.0
Farmacy	Abel	26	54	—	—	3.1	45	R	4.0
Iowa A.E.S.	Weber 84	26	54	49	48	3.6	46	R	1.5
Pioneer	1677	26	53	—	—	3.1	42	S	4.0
Iowa A.E.S.	Vickery	26	53	46	—	3.7	46	R	5.0
Thompson	T-15	26	53	48	46	3.0	46	R	4.0
Terra	Runner	26	52	—	—	3.0	45	R	3.0
Indiana A.E.S.	Keller	26	46	—	—	3.3	43	R	3.0
Sexauer	SRF 199P	27	60	—	—	3.6	43	R	4.0
Asgrow	A2187	27	58	48	—	2.6	46	R	2.0
Golden Harvest	X198 ¹	27	58	50	—	3.1	45	S	5.0
Terra	Decathlon	27	57	—	—	3.2	42	S	4.0
Seedex	2810	27	57	—	—	3.0	46	S	4.0

Table 35(continued). Yields and characteristics of public and private soybean varieties, southern zone, 1986 (Fairmont, Lamberton, Waseca)

Brand or Originator	Variety	Mature (days after August 31)	yield/acre (bushels)			Lodging (score) ²	Height (inches)	Phytophthora (reaction) ³	Chlorosis (score) ²
			1986	1985-86	1984-86				
Hy-Vigor	EX 2800R	27	57	—	—	3.0	42	S	2.0
SOI	255	27	57	48	—	3.2	42	R ⁴	5.0
Iowa A.E.S.	BSR 101	27	56	50	—	2.4	43	R	2.0
S-Brand	S-44A	27	56	—	—	2.8	42	S	5.0
Greenfield	GFS 105	27	55	—	—	3.0	46	R	4.0
Diamond	D180B ¹	27	55	—	—	3.0	45	R	4.0
SeedTec	701	27	55	—	—	3.6	45	S	5.0
Wilson Blend®	2145 ¹	27	55	—	—	3.0	41	M	5.0
Hoffman	Dawn	27	55	48	—	3.0	45	R	2.0
Lynks Seeds	8202	27	55	48	—	3.0	44	R	4.0
Riverside	1405	27	55	48	—	2.9	45	R	4.0
Latham	650	27	55	50	50	3.2	41	S	3.0
Hy-Vigor Seeds	Derby 9	27	55	48	—	3.8	46	M	5.0
Profiseed	1138	27	54	48	46	3.6	45	R	4.0
DeKalb	CX226	27	54	—	—	3.6	39	S	5.0
SRF	EXP 266B ¹	27	54	—	—	3.6	44	R ⁵	5.0
DeKalb	CX174	27	54	46	46	2.9	42	S	2.0
Payco Seeds	PS0021	27	53	48	—	2.7	43	R	4.0
Greenfield	GFS 423	27	53	—	—	2.8	46	R	3.0
Latham	551 ¹	27	53	48	48	3.2	44	S	2.0
Illinois A.E.S.	Corsoy 79	27	53	46	48	3.7	47	R	4.5
Cenex	8017	27	52	47	47	3.4	46	R	4.0
Agripro	AP200	27	51	46	45	3.1	45	R	4.0
CSB	015B	27	51	—	—	2.9	44	S	4.0
Hofler	Pearl	27	51	—	—	2.7	41	R ⁷	5.0
SOI	254	27	51	45	—	3.0	41	R	5.0
Terra	Hurdle	27	49	—	—	2.7	43	R	5.0
Indiana A.E.S.	Miami	27	45	—	—	2.9	47	R	5.0
Northrup King	S23-03	28	58	50	49	3.4	45	S	3.0
Willette Seed Farm	Prescott 108 ¹	28	57	—	—	2.9	47	R ⁶	5.0
Midwest Oilseeds	2620 ¹	28	56	—	—	3.3	42	M	5.0
Thompson	T-30P ¹	28	56	50	—	3.2	44	S	3.0
Diamond	D201	28	56	50	—	2.9	47	M	3.0
Riverside	4045	28	56	48	47	3.2	43	S	5.0
DeKalb	CX264	28	56	—	—	3.3	43	S	3.0
Iowa A.E.S.	BSR 201	28	54	48	47	3.4	42	R	5.0
Latham	561 ¹	28	55	—	—	3.3	42	S	2.0
Latham	401 ¹	28	55	—	—	2.9	43	S	2.0
Kruger	KB220A ¹	28	55	—	—	3.3	43	M	2.0
Stine	2820	28	55	—	—	3.3	46	S	2.0
SOI	226	28	55	49	50	3.2	43	S	3.0
Pride	B203	28	54	48	47	3.7	44	R ⁴	5.0
CSV	12A ¹	28	54	—	—	2.9	42	M	5.0
Kaltenberg	KB 231	28	54	49	49	3.4	46	S	4.0
Golden Harvest	H-1233	28	54	48	—	3.2	43	S	3.0
Farmacy	Eve	28	54	46	45	3.1	45	R	5.0
Hoffman	8501 ¹	28	54	48	—	3.9	44	M	3.0
Thompson	T-25	28	54	50	—	3.6	43	S	3.0
Pride	225 Brand ¹	28	54	48	—	3.3	44	M	5.0
Diamond	D195B ¹	28	53	—	—	3.7	44	S	3.0
DeSoy	330 ¹	28	53	—	—	3.0	45	M	5.0
S-Brand	S-40 C ¹	28	53	—	—	3.3	42	S	3.0
Hofler	Jewell	28	53	—	—	3.0	44	R	5.0
Funks	G3213 ¹	28	52	45	—	3.3	47	M	5.0
Agripro	AP 2190	28	52	46	46	3.4	44	R	4.0
Riverside	4042 ¹	28	52	44	44	3.6	48	R	4.0
Jacques	E85103	28	52	—	—	3.4	47	R ⁴	2.0
Dairyland	DST 2204	28	51	—	—	3.2	42	R	3.0
Ehrich	E-85	28	50	46	—	3.6	47	R	4.0
Sexauer	SX 29	28	50	44	—	3.3	46	R	4.0
Land O'Lakes	L 2330	28	49	46	—	3.7	43	R ⁵	4.0
Lakeside	107	28	48	42	—	3.2	49	R ⁴	4.0
Pride	B236	29	54	48	—	3.0	43	R	5.0
Hoffman	8300	29	54	46	—	3.6	43	S	3.0
SRF	220P	29	53	—	—	3.2	46	R	5.0
Sexauer	SX 2010	29	52	—	—	3.6	46	R	5.0
Indiana A.E.S.	Century 84	29	51	—	—	2.9	45	R	3.2
Iowa A.E.S.	Elgin	29	40	42	43	3.6	34	S	3.8
Illinois A.E.S.	Hack	30	56	50	—	3.0	42	R	4.5
Dairyland	DST2203	30	54	—	—	3.3	42	S	2.0

Table 35(continued). Yields and characteristics of public and private soybean varieties, southern zone, 1986 (Fairmont, Lamberton, Waseca)

Brand or Originator	Variety	Mature (days after August 31)	yield/acre (bushels)			Lodging (score) ²	Height (inches)	Phytophthora (reaction) ³	Chlorosis (score) ²
			1986	1985-86	1984-86				
Asgrow	A2522	30	53	46	46	3.8	49	S	3.0
Hofler	Gem	30	51	—	—	3.8	44	S	4.0
Ohio A.E.S.	Hoyt	31	58	—	—	2.1	28	R	4.0
LSD 5%			4	4	3				

¹Blend (information supplied by originator). ²1 = excellent, 5 = very poor. ³R = resistant, S = susceptible, M = mixture of R and S to races 1 and 2. ⁴also resistant to race 3. ⁵also resistant to races 3 and 4. ⁶also mixture of R and S to race 3. ⁷also mixture of R and S to races 3 and 4.

SUNFLOWER

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

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

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

A major advantage of some hybrids over the old varieties is their ability to produce a normal yield despite a shortage of insect pollinators. However, this is artifact, not true, autogamy because the hybrids increase seed size and weight to compensate for fewer seeds per head. Hybrids of 70 percent artifact autogamy suffered a 30 percent yield reduction when bees were excluded by bags; no yield reduction occurred with hybrids of 100 percent artifact autogamy (tables 37 and 38, last column). The larger seeds resulting from a shortage of bees are usually lower in oil percentage than normal-size seeds.

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

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

Companies with hybrids in these trials are: Agway Inc., Box 169, Grandin, ND 58038; Arrowhead Inc., Watertown, SD 57201; Cargill Seed Division, Box 5645, Minneapolis, MN 55440; Dahlgren and Company, Inc., 1220 Sunflower St., Crookston, MN 56716; Interstate Seed and Grain Company, Box 470, Fargo, ND 58102; Jacques Seed Co., Prescott, WI 54021; Keltgen Seed Company, Box A, Olivia, MN 56277; Northrup King Co., 1500 NE Jackson St., Minneapolis, MN 55413; PAG Seeds, Box 9480, Minneapolis, MN 55440; Saskatchewan Wheat Pool, 2625 Victoria Ave., Regina, Sask. S4T 7T9; SeedTec International Inc., Box 5692, Fargo, ND 58105; Sigco Research, Inc., Box 289, Breckenridge, MN 56520; Sokota Hybrid Producers, Brookings, SD 57006; Stauffer Seeds, Inc., 1323 23 St. S., Fargo, ND 58103.

Table 36. Yields of sunflower varieties in pounds per acre

Variety and company	Crookston	Morris	Lamberton	Rosemount	Average ¹	Crookston	Morris	Lamberton	Rosemount	Average
	1985	1985	1985	1985	1985	1981,83-85	1981,83-85	1981-85	1981-85	4 locations
Oilseed varieties										
894, USDA	2215	2266	2277	2530	2253	1464	1879	1817	2209	1842
Arrowhead 747, Arrowhead Inc.	1995	2061	2410	—	2155	1885	1769	1765	2101	1880 ²
Arrowhead 757, Arrowhead Inc.	1874	2284	2039	—	2066	1452	2187	1512	2267	1855 ³
206, Cargill	1972	2229	2583	—	2261	1621	1835	1977	2502	1984
207, Cargill	2506	1902	2181	—	2196	2092	2229	2017	2886	2306 ²
208, Cargill	1767	2143	1995	—	1968	1447	1604	1542	1750	1586 ³
DO 705, Dahlgren	1802	1503	2514	—	1940	1478	1555	2064	2558	1914
DO 730, Dahlgren	2127	2260	2260	—	2216	1871	1592	1616	3209	2072 ³
DO 855, Dahlgren	1499	1817	2248	—	1855	1440	2142	1899	2507	1997 ⁴
Cenex 8101, Interstate	2114	2402	2478	—	2331	1788	2182	1839	2738	2137 ³
IS 3001, Interstate	2153	2231	2490	—	2291	1690	1823	1994	2323	1958 ²
IS 3003, Interstate	1772	1978	2286	2043	2012	—	—	—	—	—
IS 3214, Interstate	1956	2352	1644	1824	1984	—	—	—	—	—
IS 3312, Interstate	1631	1838	2568	2651	2012	—	—	—	—	—
IS 7111, Interstate	2061	1957	2682	—	2233	1434	1769	1974	2302	1870 ²
Challenger, Jacques	1726	1925	2236	—	1962	1434	1520	1836	2483	1818 ³
Columbia II, Jacques	1872	1935	2350	2609	2052	—	—	—	—	—
Discovery, Jacques	1791	2319	2096	—	2069	1603	1758	1779	2593	1933 ³
KO-66, Keltgen	1962	1787	2143	—	1964	1719	1767	1826	2539	1963 ²
Sunbred 262, Northrup King	2246	2008	2299	—	2184	1753	1841	1897	2392	1971 ³
Sunbred 285, Northrup King	2387	2559	2622	—	2523	1917	2211	1934	2657	2180 ³
PAG SF 100, PAG Seeds	1826	2528	2448	—	2267	1444	1783	1866	1740	1708 ³
PAG SF 102, PAG Seeds	2257	2037	2606	—	2300	1758	1592	2012	2177	1885 ⁵
PAG SF 103, PAG Seeds	2554	2084	2590	—	2409	2136	2283	2159	2997	2394 ³
Sun M20, Sask. Wheat Pool	1069	804	1975	—	1283	672	1227	1664	2366	1482 ³
Sun M21, Sask. Wheat Pool	1100	1175	2123	2000	1466	—	—	—	—	—
SeedTec 315, SeedTec Int'l	2318	2249	2266	—	2278	1804	2017	1958	2244	2006 ⁶
SeedTec 316, SeedTec Int'l	2053	2218	2347	—	2206	1826	2238	1960	2302	2082 ²
SeedTec 317, SeedTec Int'l	1362	1761	1660	—	1594	1698	2212	1677	2105	1923 ⁴
SeedTec 318, SeedTec Int'l	2000	2837	2184	1949	2340	—	—	—	—	—
X30084, SeedTec Int'l	1928	1826	2029	2405	1928	—	—	—	—	—
SeedTec XR38, SeedTec Int'l	1398	2274	1882	1413	1851	—	—	—	—	—
SeedTec SS300, SeedTec Int'l	2470	1815	2404	—	2230	—	—	—	—	—
SeedTec 634 Brand, SeedTec Int.	2080	2533	2358	—	2324	1828	2229	1718	2056	1958 ⁷
SIGCO 455, Sigco Research	2121	1561	1913	—	1865	1707	2103	1836	2140	1947 ⁴
SIGCO 456, Sigco Research	1984	2339	2289	—	2204	1908	2228	1796	3032	2241 ³
SIGCO 465, Sigco Research	2214	1609	2399	1702	2074	—	—	—	—	—
SIGCO 468, Sigco Research	1833	2016	2330	—	2060	1544	1860	1737	1357	1625 ³
SIGCO 475, Sigco Research	2262	2289	2105	2174	2219	—	—	—	—	—
Sokota 2057, Sokota Hybrid	1938	1730	2567	—	2078	1332	1842	2050	2530	1939 ²
Sokota 2200, Sokota Hybrid	1743	1686	2712	2241	2047	—	—	—	—	—
Sokota 5000, Sokota Hybrid	1914	2265	2306	—	2162	1392	1959	1716	1988	1764 ⁸
S-1300, Stauffer Seeds	1712	2149	2694	—	2185	1373	1476	2168	2099	1779 ⁴
S-1888, Stauffer Seeds	1944	2222	2423	—	2196	1500	1983	1825	2353	1915 ²
EX 1296, Stauffer Seeds	1918	2527	2637	2607	2361	—	—	—	—	—
EX 1424, Stauffer Seeds	1896	1894	2651	2013	2147	—	—	—	—	—
Sputnik, USSR	—	—	—	1762	—	—	—	—	2359	—
LSD 5%	314	716	450	726	289	198	276	185	255	116
Nonoilseed varieties										
924, USDA	1554	1585	1858	2039	1666	1250	1833	1600	2398	1770
Royal Hybrid 2141, Agway	2489	2285	2268	—	2347	1900	2317	2185	2900	2326
D131, Dahlgren	2027	2557	2260	—	2281	1909	2547	1872	2565	2223
D141, Dahlgren	2029	1494	2598	2349	2040	—	—	—	—	—
SIGCO 954, Sigco Research	2181	2275	2361	—	2272	1650	2442	1876	2751	2180
SIGCO 964, Sigco Research	2214	1599	2387	—	2067	1777	2121	1977	2442	2079 ²
SeedTec 043, SeedTec Int'l	2093	1948	2391	2154	2144	1594	2102	2069	2418	2046 ⁹
LSD 5%	315	452	404	726	249	202	275	225	256	121

¹Crookston, Morris, Lamberton. ²1982-85. ³1984-85. ⁴1983-85. ⁵1981-82, 84-85. ⁶1981-82, 85. ⁷1982, 84-85. ⁸1981-83, 85. ⁹1982-83, 85.

Table 37. Characteristics of oilseed sunflower varieties, four location average

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

¹10 percent moisture basis. Crookston and Morris 1981, 83-85; Lamberton and Rosemount 1981-85. ²Rosemount 1981-84; Crookston 1985. ³Crookston and Morris 1983-85; Lamberton 1982-85; Rosemount 1982. ⁴Crookston and Rosemount 1983-84. ⁵Down or broken stalks. Crookston 1983-84; Morris 1983-85; Lamberton 1982, 84-85; Rosemount 1983-84. ⁶Crookston 1981, 83; Morris 1981, 83-85; Lamberton 1982-84; Rosemount 1982-85. ⁷Crookston 1981, 83-85; Morris 1985; Lamberton 1982, 85; Rosemount 1981-85. ⁸Damaged ray flowers and cupped heads. Crookston 1981-82; Morris 1981. ⁹100 times yield of self-pollinated plants (covered with bags) divided by yield of cross-pollinated plants (no bags). Rosemount 1981-85.



Robert Robinson talks about sunflowers to visitors at a field day event. Dr. Robinson, who retired in February of 1986, supervised the production of this varietal trials publication during his entire 38-year career.

Table 38. Characteristics of nonoilseed sunflower varieties, four location average

Variety and company	Large seed (percent) ¹	Test weight/ bushel (pounds) ²	Seeds/ pound (number) ²	Planting to		Lodging (percent) ⁵	Height (inches) ⁶	Head moisture (percent) ⁷	Seed moisture (percent) ⁸	Midge damage (percent) ⁹	Artifact autogamy (percent) ¹⁰
				bloom (days) ³	mature (days) ⁴						
924, USDA	69	25	3630	73	124	19	66	59	27	79	96
Royal Hybrid 2141, Agway	33	28	3980	72	124	4	68	62	22	83	69
D 131, Dahlgren	29	27	4090	73	123	8	64	62	22	57	82
D 141, Dahlgren	28	26	4450	74	123	7	62	59	—	—	100
SIGCO 954, Sigco Research	46	25	3340	71	123	9	64	60	24	68	71
SIGCO 964, Sigco Research	36	26	3880	70	121	6	62	48	18	52	62
SeedTec 043, SeedTec Int'l.	26	26	4490	73	122	1	63	59	19	68	89
LSD5%								3	10	12	13

¹Held on a 20/64 round-hole sieve. Crookston and Morris 1981, 83-85; Lamberton and Rosemount 1981-85. ²Crookston and Morris 1981, 83-85; Lamberton and Rosemount 1981-85. ³Crookston 1983, 85; Morris 1983-85; Lamberton 1982-85; Rosemount 1982. ⁴Crookston and Rosemount 1983-84. ⁵Down or broken stalks. Crookston 1981, 83, 84; Morris 1981, 83-85; Lamberton 1982, 84-85; Rosemount 1983-84. ⁶Crookston 1981, 1983; Morris 1981, 83-85; Lamberton 1982-84; Rosemount 1982-85. ⁷Crookston 1981, 83-85; Morris 1985; Lamberton 1982, 85; Rosemount 1981-85. ⁸Lamberton 1981, 83. ⁹Damaged ray flowers and cupped heads. Crookston 1981-82; Morris 1981. ¹⁰100 times yield of self-pollinated plants (covered with bags) divided by yield of cross-pollinated plants (no bags). Rosemount 1981-85.

Pulse Crops

ADZUKI

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

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

All varieties in trials from 1980-83 were severely damaged by bacterial stem rot disease for which no control has been developed. The disease did not develop in 1984 or 1985, and adzuki yields were high in both research plots and farm fields. The uncertainty of where

or when severe losses will occur has delayed rapid expansion of adzuki production.

Research plot yields of Takara and Minoka varieties have ranged from 0 to 4,000 pounds and averaged about 1,400 pounds per acre. The plants mature in about 112 days and are about 22 inches tall.

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

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

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. Minnesota's 1984 production amounted to 59 percent navy, 29 percent pinto, 11 percent red kidney, and 1 percent other classes. Varietal recommendations are confined to varieties within the navy, small white, pinto, dark red kidney, light red kidney, pink, black turtle soup, great northern, and small red classes. Other classes are grown successfully, but important differences among varieties within their classes have not yet been identified in our trials.

RECOMMENDED VARIETIES

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

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

Bunsi navy—Medium yield. Late. Erect vine. Medium size, navy seed. Released by Colombian Agriculture Institute. Rereleased by Michigan Agricultural Experiment Station in 1983.

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

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

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

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

Fiesta pinto—High yield. Early. Large, prostrate vine. Large, pinto seed. Released by Idaho Seed Bean Co., Twin Falls, ID 83303 in 1981. Seed sale regulated by U.S. Variety Protection Act.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

VARIETIES NOT ADEQUATELY TESTED

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

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

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

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

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

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

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

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

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

OTHER VARIETIES

Admiral navy—Medium yield. Late. Bush. Released by Idaho Seed Bean Co., Twin Falls, ID 83303 in 1981.

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.

Table 39. Characteristics of fieldbean varieties

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

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

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

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

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

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

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

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

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

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

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

NW 410 pinto—High yield. Late. Large, prostrate vine. Small, pinto seed. Released by Washington Agricultural Experiment Station and USDA in 1980.

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

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

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

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

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

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

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

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

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

Table 39 (continued). Characteristics of fieldbean varieties

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

¹Irrigated. ²V = vine, SV = short vine, ESV = erect short vine, B = bush. ³1985. ⁴1983-85. ⁵1984-85. ⁶1984. ⁷1983-84. ⁸1982,85.

Table 40. Reaction of fieldbean varieties to some important pathogens and air pollution¹

Class and variety	Rust ²	Blight ²		Mosaic ³		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									
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									
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									
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									
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									
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									
Snow-Bunting	S	S	T	T	S	AB	S	S	S
Snow-Flake	S	S	T	S	S	A	S	S	S
Up-Land	T	S	T	T	S	A	S	S	S
Admiral									
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									
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									
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									
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									
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

Table 40 (cont.). Reaction of fieldbean varieties to some important pathogens and air pollution¹

Class and variety	Rust ²	Blight ²		Mosaic ³		Anthracnose ³	Fusarium root rot ²	White mold ²	Air pollution ²
		common	halo	V1	V15				
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 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 41. More information on these crops is available in Minnesota Agricultural Experiment Station AD-MR-2339: "Crop sequence effects of pulse crops and agronomic research on lupine."

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

RECOMMENDED VARIETIES

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

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

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

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

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

Trapper—Low yield. Late maturity. Long vined. Small, cream-colored seed. Suitable for birdfeed markets that require small, "yellow" seed. Released by Agriculture Canada, Morden. Licensed in 1970.

VARIETIES NOT ADEQUATELY TESTED

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

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

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

OTHER VARIETIES

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

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

Table 41. Characteristics of fieldpea varieties, fababean, lupine, and tangierpea

Variety	Seed yield/acre (pounds)					Seeds/ pound (number)	Seed protein ² (percent)	Planting to		Plant length (inches)
	Becker ¹ 1981-85	Grand Rapids 1981-85	Crookston 1981,85	Roseau 1985	Average 13 trials			bloom (days)	maturity (days)	
Century	1770	1925	2505	1995	1960	2140	26	64	104	57
Lenca	2235	2231	2965	2084	2334	2480	25	63	102	50
Miranda	3467	2543	3388	2280	3008	1440	23	57	97	21
Paloma	3211	2432	3029	1862	2780	1630	25	59	99	21
Procon	3076	2725	3190	2964	2950	1840	25	58	97	27
Trapper	1823	1759	2190	344	1741	3660	27	64	106	55
Belinda 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.

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.

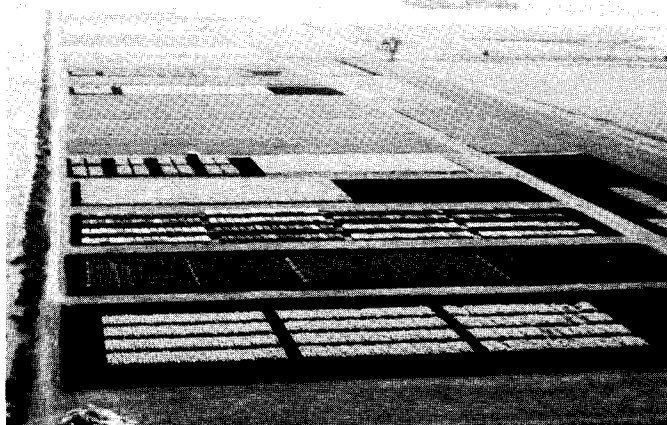
Eston—High yield. Medium maturity. Short. Very small seed. Released by University of Saskatchewan. Licensed in 1981. Production of certified seed limited to Canada.

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.



An aerial view shows many of the test plots at the Northwest Experiment Station at Crookston.

Table 42. Characteristics of lentil varieties

Variety	Seed yield/acre (pounds)			Seeds/ pound (number)	Seed protein (percent) ²	Height (inches)	Lodging (score) ³	Planting to	
	Grand Rapids 1982-85	Crookston 1981,85	Becker ¹ 1982-84					bloom (days)	maturity (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	or
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.