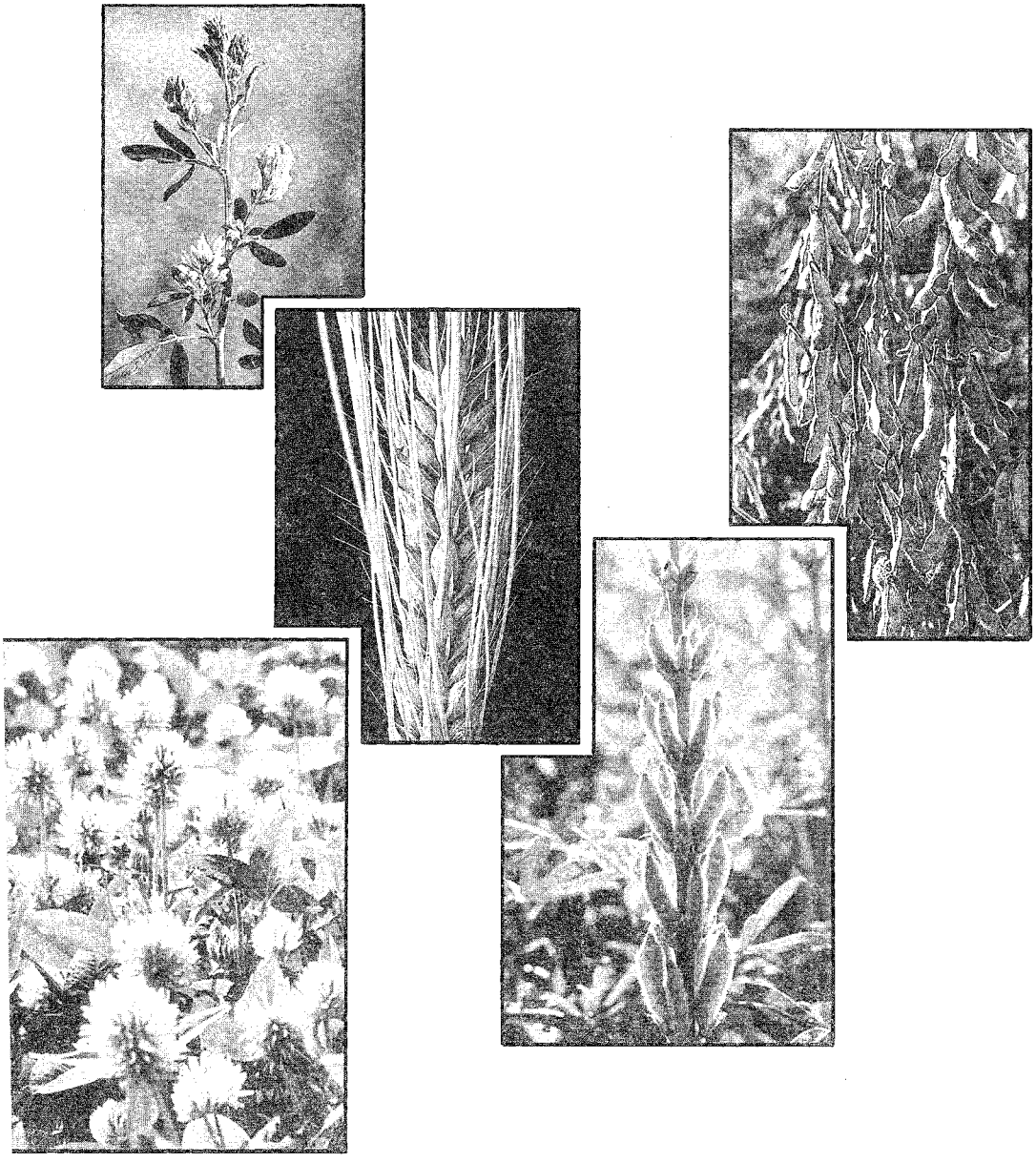
1993 Edition

VARIETAL TRIALS

OF SELECTED FARM CROPS



Forage Crops

Grain Crops

Oilseed Crops

Pulse Crops

Planting Rate & Date

Minnesota Agricultural Experiment Station — University of Minnesota

Minnesota Report 226-1993 (AD-MR-5615-E)

CONTENTS

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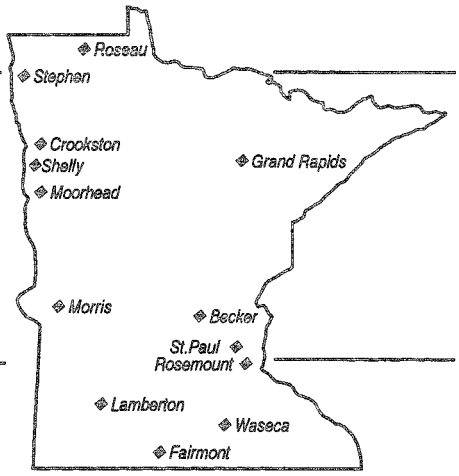
OF SELECTED FARM CROPS



Locations of varietal trials reported in this publication.

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

Minnesota Agricultural Experiment Station scientists are not currently conducting performance trials for many crops which were included in previous editions of this publication. For those who want the most recent reports of tests or additional production information, a contact address and/or alternate publication source is indicated under each crop heading.

Variety Classifications

Varieties of many of the evaluated crops are classed into four groups: "recommended varieties," "varieties not adequately tested," "other varieties," and "privately developed varieties." Some crops have further groupings within these categories. Varietal descriptions are arranged alphabetically within groups. Table entries are generally arranged either in alphabetical order within groups and subgroups, or according to a scoring standard relating to quality, maturity or yield. Where a section has more than one table, order of arrangement will generally be the same in each.

Classifications of varieties as "recommended," "other" and "private" are determined each year by the Minnesota Agricultural Experiment Station Crop Variety Review Committee. A variety is usually not eligible for the "recommended" group unless it has been better than other varieties in important characteristics in three years of testing.

New varieties from other public experiment stations and private plant breeders that have not been sufficiently evaluated here are listed as "varieties not adequately tested." Available information is presented for these varieties, but no conclusions are drawn regarding their suitability for Minnesota growing conditions.

Listings in an "other varieties" category are usually inferior in one or more characteristics, as demonstrated in comparative tests.

Varieties in the "private" category are good performing varieties, on which the MAES does not make recommendations.

Seed of "private," "other" and "not adequately tested" varieties 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 1993 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 offices.

Interpreting the Tables

The LSD (Least Significant Difference) figures listed under the yield columns in many 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 value listed at the bottom of a yield column, it can be concluded that the higher yielding variety was superior. If the difference is less, the variation was probably due to environmental rather than varietal differences. The notation "NS" in a column indicates no significant difference exists for that characteristic.

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 variously indicated in the tables as date of maturity, heading or blooming; days to maturity, heading or blooming; or moisture percentage at harvest.

Authors and Researchers

Authors of the crop sections are: D.H. Putnam, (amaranth, canola, crambe and oilseed rape); D.K. Barnes, N.P. Martin and N.J. Ehlke (alfalfa, birdsfoot trefoil, orchardgrass, reed canarygrass, and timothy); D.C. Rasmusson (barley); D.D. Stuthman (oat); J.H. Orf (soybean); R.H. Busch (durum, hard red spring, and winter wheat); and R. Porter (wild rice).

Information on the reaction of varieties to specific pathogens was largely obtained by these members of the Department of Plant Pathology: A.P. Roelfs (wheat); R. Wilcoxson (barley and oat); K.J. Leonard (oat); N. Young and W. Stienstra (soybean); and D.V. McVey (wheat).

Field work for 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.

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FORAGE CROPS

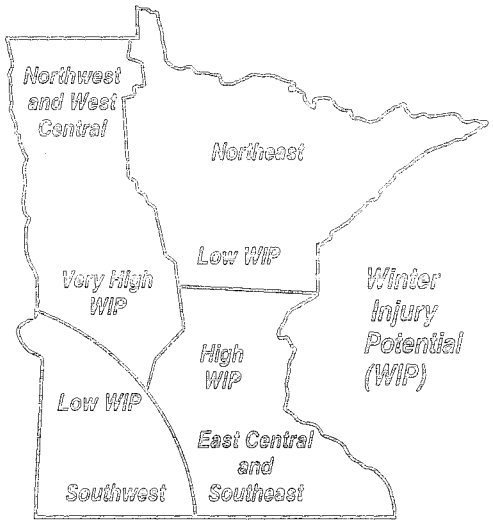
ALFALFA

Winterhardiness and Fall Dormancy

Severe winters make winter hardiness a primary consideration in variety selection for most areas of Minnesota. The 1989-90 and 1991-92 winters were very damaging to alfalfa stands over wide areas of the state. These test winters confirmed previous observations about areas of the state most prone to winter injury (see winter injury potential map). They also provided data about the relative winter hardiness as measured by percent winter survival for most current varieties (table 1).

The greatest winter hardiness is needed in the west central and northwest regions of Minnesota (see map below). Because of the high frequency of severe winters in this area only winter-hardy or very winter-hardy varieties should be selected. The east central and southeast regions also experienc frequent severe winters. Winter-hardy varieties with high levels of disease resistances should be selected for those areas.

Minnesota's southwest region seldom experiences severe winter injury because of dry soils, high soil potassium levels and neutral soil pH. Northeastern areas of Minnesota also seldom experiences severe winter injury because of dependable snow cover. For these reasons both winter-hardy and moderately winter-hardy varieties have been profitable in those areas.



The varieties listed in tables 1 and 2 are ranked according to amount of fall growth, which in Minnesota is an indication of rate of growth after cutting as well as, to a lesser degree, winter hardiness. Very fall dormant varieties produce very little fall growth and are slow to recover after cutting. They usually are not high yielding, recover slowly for the second crop and produce only a small third crop because of early cessation of growth. Nevertheless, these are very dependable varieties in areas where frequent winter injury is expected and where soil moisture limits third crop yields. These types of varieties survived the 1989-90 and 1991-92 winters with little injury.

Fall dormant varieties are adaptable to all areas of the state. Forage yields vary among varieties in this group, primarily because of winter hardiness and disease resistance. Three or four years of consistent production can be expected from fall dormant varieties with high levels of winter hardiness.

Moderately fall dormant varieties produce good fall growth, are characterized by rapid recovery after harvest, and usually reach $^{1}/_{10}$ bloom several days earlier than more dormant varieties. The general pattern of production for moderately dormant varieties under four-harvest management has been to produce high yields during the first year after seeding, good yields--similar to winter-hardy, fall dormant varieties--for year two, and reduced yields in year three and four. The reduced yields in years three and four are usually associated with winter injury. The percent winter survival data in table 1 and third and fourth year yields in table 2 can help identify varieties that maintain high yields beyond the second year in the areas that experience frequent winter injury.

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

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

Other nonwinter-hardy varieties not listed in the tables include Armona, Arroyo, Condor, CUF 101, DK 187, DK 189, Falcon, Florida 77, GT 13R Plus, Madera, Maricopa, Mecca, Moapa 69, Pierce, Sundor, SW 14, UC Cibola, WL 515, WL 516, WL 605, Yolo, 13R Supreme, 5715, 5888, and 5929.

Disease Resistance and Stand Persistence

Alfalfa root and crown diseases occur in most Minnesota soils. The most important diseases are: bacterial wilt, Phytophthora root rot, Fusarium wilt, anthracnose and Verticillium wilt. Plant resistance is available for all five diseases. Variety resistance ratings for each disease are presented in table 1. Moderate resistance (MR) to a disease will provide protection to a variety under most conditions. However, either resistance (R) or high resistance (HR) are required for protection under severe disease conditions.

Winter injury can be the result of a combination of injury from cold temperatures and from root and crown diseases. Under some conditions disease resistances can compensate for lesser levels of cold tolerance. All varieties can benefit from improved disease resistance. However, it is especially important for moderately fall dormant varieties to have at least R levels of disease resistance to stay productive for more than two years after the seeding year under intensive, four cuts per season management in east central and southeast Minnesota (winter injury potential map).

Large alfalfa variety management and pathology studies have been conducted at the Rosemount Station for more than four decades.

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

Phytophthora Root Rot—This fungal disease is a major concern on poorly drained soils, especially in the east central and southeast areas of the state. It can cause stand losses of seedlings, and can contribute to lower productivity in older stands if the soil remains wet for a week or more.

Fusarium Wilt—The fungus that causes Fusarium wilt is present in most soils. It contributes to stand decline mainly in combination with other disease organisms. Therefore, resistance to Fusarium wilt in addition to resistance to both bacterial wilt and Phytophthora root rot contributes to longer lived stands.

Anthracnose—This fungus disease was first found in Minnesota in 1978 and has become more prevalent each year in the east central and southeast areas. It infects stems and crowns and kills susceptible plants. The disease is favored by hot, moist conditions, and will be most frequently observed in southeast Minnesota.

Verticillium Wilt—This is a relatively new, potentially destructive fungus disease that was first found in several eastern Minnesota fields in 1981. It has usually been found in two- or three-year-old fields. Its spread in the state has been slow. Planting resistant varieties will help insure long lived stands. Varieties having at least a low level of resistance are indicated in table 1.

Table 1. Fall growth score, winter hardiness as indicated by percent stand survival after severe test winters, and disease resistance of alfalfa varieties eligible for certification and marketed in the Minnesota area.

Variety	Developer or Marketer[1]	Fall growth	Winter survival	Bacterial wilt	Phytophthora root rot	Fusarium wilt	Anthracnose	Verticillium wilt
		score[2]	%[3]	rating[4]				
Very Fall Dormant								
Spredor 2	Northrup King[m]	7.5	60	HR	HR	S	MR	S
Teton	S. Dakota Agr. Exp. Sta.[Qz]	7.4	—	LR	LR	MRS	—	—
Travois	S. Dakota Agr. Exp. Sta.[Qj]	7.4	—	R	S	MR	S	—
Fall Dormant								
Wrangler	USDA & Nebraska Agr. Exp. Sta.[BQgijnorswz]	7.0	71	R	R	R	LR	LR
Vernal	Wisconsin Agr. Exp. Sta. & USDA[BIQgijnorswz]	6.5	67	R	S	R	S	S
Baker	USDA & Nebraska Agr. Exp. Sta.[Q]	6.5	53	R	S	R	LR	—
636	ICI Seeds[Y]	6.3	25	HR	HR	R	MR	R
Clipper	Interstate Seed Co.[a]	6.3	38	HR	R	HR	R	R
Envy	Gold Country Seed[Oe]	6.3	49	HR	R	HR	HR	R
Profit	Peterson-Biddick Co.[Jo]	6.2	50	HR	R	HR	MR	R
Viking I	Northrup King[m]	6.2	—	R	R	HR	R	HR
Milkmaker II	Dahlgren & Co[Me]	6.1	—	R	R	MR	—	—
Agate	USDA & Minnesota Agr. Exp. Sta.[BQnorwz]	6.0	29	HR	R	HR	MR	—
Iroquois	Cornell University[Bjsz]	6.0	—	HR	S	MR	S	S
Blazer	Cenex/Land O'Lakes[l]	5.9	—	HR	MR	MR	LR	LR
Nordic	ICI Seeds[Y]	5.9	45	HR	HR	R	R	R
Renegade	Gertson Seed Farms[U]	5.9	31	R	MR	R	S	LR
Flagship 75	DSM[RV]	5.8	—	HR	HR	HR	R	R
Alfagraze	University of Georgia[BEhiy]	5.7	11	MR	LR	R	MR	—
5262	Pioneer Hi-Bred International, Inc.[p]	5.7	60	HR	R	MR	—	LR
5246	Pioneer Hi-Bred International, Inc.[p]	5.7	—	HR	HR	HR	HR	R
WL 225	W-L Research, Inc.[a]	5.7	9	HR	R	HR	MR	R

Table 1 (continued). Fall growth score, winter hardiness as indicated by percent stand survival after severe test winters, and disease resistance of alfalfa varieties eligible for certification and marketed in the Minnesota area.

Variety	Developer or Marketer[1]	Fall growth	Winter survival	Bacterial wilt	Phytophthora root rot	Fusarium wilt	Anthracnose	Verticillium wilt
		score[2]	%[3]	rating[4]				
Trident II	Cargill, Inc.[H]	5.6	37	HR	R	HR	R	R
break-thru	Custom Farm Seed[L]	5.5	34	HR	MR	HR	MR	R
DK 122	DeKalb Plant Genetics[P]	5.5	—	HR	HR	R	HR	R
GH 777	Golden Seed[V]	5.5	—	HR	HR	HR	R	R
120	DeKalb-Plant Genetics[P]	5.5	43	HR	R	MR	LR	—
A-54	Ramy Seed Co.[BS]	5.4	—	MR	LR	MR	—	—
Alpine	Bio Plant Research[F]	5.4	16	HR	R	R	R	R
Bolt ML	Jung Farms[d]	5.4	—	R	HR	HR	HR	R
Ranger	USDA & Nebraska Agr. Exp. Sta.[BQjo]	5.4	57	MR	S	MR	S	S
Aggressor	AgriPro[BEhiy]	5.3	—	HR	HR	HR	HR	R
Blazer XL	Cenex/Land O'Lakes[I]	5.3	42	R	HR	HR	HR	R
Dart	AgriPro[C]	5.3	25	HR	HR	R	R	R
Milkmaker	Kaltenberg Seed Farms[e]	5.3	21	R	R	HR	MR	—
Thrive	Great Lakes Hybrids[W]	5.3	48	HR	HR	HR	HR	R
Arrow	NAPB[BEhijy]	5.2	37	HR	HR	HR	MR	R
MultiKing 1	Northrup King[m]	5.2	62	HR	R	HR	R	R
Webfoot	Great Lakes Hybrids[W]	5.2	48	R	R	MR	S	--
Zenith	Super Crost Seeds[Y]	5.2	48	HR	HR	R	HR	R
Achieva	Allied Seed Co.[D]	5.1	—	R	HR	HR	HR	R
Class	Crop Mate[K]	5.1	—	HR	HR	R	HR	R
GH 715	J.C.Robinson Seed[b]	5.1	44	HR	MR	R	MR	LR
Impact	Peterson Seed Co., Inc.[Rr]	5.1	27	HR	HR	R	MR	R
Oneida	Cornell University[oz]	5.1	56	HR	HR	HR	S	—
Royalty	Cargill Seed Division[H]	5.1	—	HR	R	R	HR	R
Moderately Fall Dormant								
Ultra	SeedTec Int'l[C]	5.0	16	HR	R	HR	HR	R
Cutter	Interstate Seed[a]	4.9	31	HR	HR	HR	R	R
WL 322 HQ	W-L Research, Inc.[a]	4.9	—	HR	R	HR	MR	R
Agri-MATE	Cropmate Co.[K]	4.8	20	HR	R	HR	R	R
Husky	Premium Seed[r]	4.8	35	R	MR	R	MR	S
Kingstar	Dahlgren & Co. Inc.[M]	4.8	19	R	R	HR	MR	R
Oneida VR	Cornell University[gnsz]	4.8	24	R	MR	HR	MR	HR
VIP	SIGCO Research[u]	4.8	15	HR	R	HR	R	R
WL 317	W-L Research Inc.[a]	4.8	23	HR	R	HR	R	R
Agri-Boss	CropMate Co.[K]	4.7	39	HR	HR	HR	HR	MR
Apollo Supreme	ABI[BEhij]	4.7	39	HR	R	HR	HR	R
Elevation	Jacques Seed Co.[c]	4.7	33	HR	R	R	R	MR
GH 747	Golden Seed[V]	4.7	—	HR	HR	R	HR	MR
Magnum	Dairyland Seed Co., Inc.[N]	4.7	36	HR	S	R	MR	—
Perry	USDA & Nebraska Agr. Exp. Sta.[J]	4.7	—	R	LR	R	LR	—
2833	CIBA-GEIGY Seed Div.[J]	4.6	48	HR	HR	R	HR	R
5432	Pioneer Hi-Bred International Inc.[p]	4.6	29	HR	MR	HR	—	R
Commander	Northrup King[m]	4.6	52	HR	R	R	HR	MR
Flint	Premium Seed Co., Inc.[r]	4.6	38	R	HR	R	HR	LR
Endure	PAG Seeds[H]	4.6	31	R	MR	R	MR	R
Fortress	Northrup King[m]	4.6	13	R	R	R	R	R
Jade	NC+ Hybrids[E]	4.6	39	HR	HR	HR	R	R
Quest	Renk Seed[t]	4.6	13	HR	HR	HR	R	R
2841	CIBA-GIEGY Seed Div.[J]	4.5	20	HR	R	HR	R	R
Apollo II	ABI[BEhiy]	4.5	23	R	HR	R	MR	MR
Chief	Jacques Seed Co.[c]	4.5	17	HR	HR	R	R	R
DK 125	DeKalb Plant Genetics[P]	4.5	13	HR	R	R	HR	R
DK 133	DeKalb Plant Genetics[P]	4.5	—	HR	HR	HR	HR	R
DK 135	DeKalb Plant Genetics[P]	4.5	28	MR	MR	R	MR	MR
GH 737	J.C.Robinson Seed[b]	4.5	27	HR	MR	HR	MR	R
Legend	Cenex/Land O'Lakes[I]	4.5	24	HR	R	HR	HR	R
Multi-plier	Jacques Seed Co.[c]	4.5	54	HR	R	HR	HR	R
Saranac	Cornell University[Qr]	4.5	20	R	S	R	S	S
Stein 9227	Stein Seed Farm Inc.[v]	4.5	41	HR	HR	HR	HR	R
Target II	Bio Plant Research[F]	4.5	—	HR	R	R	R	R

Table 1 (continued). Fall growth score, winter hardiness as indicated by percent stand survival after severe test winters, and disease resistance of alfalfa varieties eligible for certification and marketed in the Minnesota area.

Variety	Developer or Marketer[1]	Fall growth	Winter survival	Bacterial wilt	Phytophthora root rot	Fusarium wilt	Anthracnose	Verticillium wilt
		score[2]	%[3]	rating[4]				
Trident	PAG Seeds[H]	4.5	—	R	HR	HR	MR	—
RamRod	Bio Plant Research[F]	4.5	55	HR	R	R	MR	R
Voyager	Bio Plant Research[Φ]	4.5	31	HR	R	R	MR	MR
630	ICI Seeds[Y]	4.5	28	HR	R	R	MR	MR
5333	Pioneer Hi-Bred International Inc.[P]	4.5	—	HR	R	HR	HR	MR
Bronco	Jung Farms' Inc.[d]	4.4	14	HR	HR	HR	HR	R
Allegiance	Keltgen Seed Co.[f]	4.4	34	HR	R	R	HR	R
Dynasty	Dairyland Seed Co. Inc.[N]	4.4	19	HR	R	R	MR	R
Gourmet Hay	Fred Gutewein & Sons[T]	4.4	51	HR	R	HR	HR	R
Magnum III-Wet	Dairyland Seed Co., Inc.[N]	4.4	—	—	R	R	MR	MR
Vector	ProfiSeed, Inc.[nq]	4.4	15	HR	MR	HR	R	MR
Verta+	NC+ Hybrids[k]	4.4	29	HR	R	R	HR	R
5364	Pioneer Hi-Bred International, Inc.[P]	4.4	—	R	MR	R	MR	MR
Aquarius	Lincoln Seed & Feed Co.[j]	4.3	—	HR	S	R	HR	—
Sure	Cenex/Land O'Lakes[l]	4.3	22	HR	R	HR	HR	R
Crown	Paymaster Seeds[H]	4.2	15	R	R	R	HR	R
GH 755	J.C. Robinson Seed[b]	4.2	—	HR	HR	HR	HR	R
Good as Gold	Mike Brayton Seeds[x]	4.2	—	HR	HR	HR	R	R
Promise	ICI Seeds[Y]	4.2	3	HR	HR	HR	HR	R
WL 320	W-L Research Inc.[a]	4.2	31	HR	R	HR	MR	MR
Crown II	Cargill Seed Div.[H]	4.1	48	HR	R	R	HR	R
Hi-Phy	Premium Seed Co., Inc.[Sr]	4.1	—	HR	HR	MR	—	—
New Era 90	Stine Seed Farm[v]	4.1	17	HR	HR	HR	HR	R
Pro-Cut 2	L. Herried Seed, Inc.[h]	4.1	9	HR	HR	HR	R	R
Terminator	Ramy Seed Co.[gs]	4.1	24	HR	MR	HR	R	R
Magnum +	Dairyland Seed Co., Inc.[N]	4.0	13	R	R	R	MR	LR
Magnum III	Dairyland Seed Co., Inc.[N]	4.0	17	HR	MR	R	MR	MR
Pro-Cut	L. Herried Seed, Inc.[h]	4.0	15	HR	R	HR	R	R
EMPRESS	Blaney Seeds, Inc.[G]	3.9	9	HR	HR	HR	R	R
2852	CIBA-GEIGY Seed Div.[J]	3.8	19	HR	R	R	HR	R
Cimarron	Great Plains Research[X]	3.6	19	R	MR	HR	R	LR
Belmont	Great Plains Research[Xe]	3.2	—	HR	R	R	HR	R
Cimarron VR	Great Plains Research[Xe]	3.2	26	HR	R	R	HR	R
Non-Dormant								
Nitro	USDA & Minnesota Agr. Exp. Sta.[nr]	2.4	—	S	R	HR	S	S

[1] 1993 seed sources are listed at the end of the forage crops section; [2] Based on fall growth in mid-October after cutting 1st week of September: 1 = tallest (tend to be least winterhardy), 9 = shortest; [3] Percent stand survival after severe test-winters, data are averages over tests based on percent of Vernal and adjusted to average Vernal stand (greater than 40% stand will provide profitable yields); [4] Resistance rating (percent resistant plants): HR = high resistance (51 +), R = resistant (31-50), MR = moderate resistance (16-30), LR = low resistance (6-15), and S = susceptible (0-5). Fall growth, bacterial wilt, Phytophthora root rot, and Fusarium wilt data are primarily from University of Minnesota evaluation. Anthracnose and Verticillium wilt values were published by the Certified Alfalfa Seed Council.

Table 2. Average yields of alfalfa varieties expressed as percentage of Vernal for all tests with one or more harvest years (1967-1991) in each of four climatological areas within Minnesota.[1]

	Average yield for years 1-2 and 3-4 after seeding per test location										
	Rosemount & Waseca		Morris & Crookston		Lamberton		Grand Rapids		All locations		Number
Variety	1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4	tests
	% of Vernal										
Very Fall Dormant											
Spredor 2	93	85	95	108	—	—	94	94	94	92	6
Teton	—	—	102	99	—	—	—	—	102	99	1
Travois	—	—	94	91	—	—	—	—	94	91	1

Table 2 (continued). Average yields of alfalfa varieties expressed as percentage of Vernal for all tests with one or more harvest years (1967-1991) in each of four climatological areas within Minnesota.

	Average yield for years 1-2 and 3-4 after seeding per test location										
	Rosemount & Waseca		Morris & Crookston		Lamberton		Grand Rapids		All locations		Number
Variety	1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4	tests
	% of Vernal										
Fall Dormant											
Wrangler	105	107	106	101	98	102	100	95	103	102	7
Vernal, tons/acre 15% M	5.97	5.29	5.40	4.53	5.11	4.86	4.12	3.80	5.15	4.62	62
Baker	99	105	97	102	107	103	89	82	98	100	17
636	110	107	99	104	101	106	103	102	105	106	6
Clipper	102	90	100	101	100	91	106	102	101	95	7
Envy	111	90	102	112	102	110	—	—	106	100	7
Profit	110	110	96	95	107	107	105	113	105	108	6
Viking 1	109	—	—	—	—	—	—	—	109	—	1
Milkmaker II	104	—	106	—	111	—	—	—	106	—	3
Agate	100	107	97	101	100	100	89	96	99	100	18
Iroquois	103	102	105	107	103	112	121	96	106	104	12
Blazer	108	114	95	104	102	—	100	104	104	111	10
Nordic	100	—	113	—	110	—	—	—	105	—	3
Renegade	111	87	103	—	104	—	96	—	106	87	5
Flagship 75	102	—	—	—	—	—	—	—	102	—	1
Alfagraze	103	74	91	—	103	—	103	—	101	74	7
5262	108	105	97	108	103	113	112	—	104	108	6
5246	110	—	—	—	—	—	—	—	110	—	1
WL 225	103	90	93	101	101	101	107	105	99	98	6
Trident II	105	—	107	—	114	—	104	—	106	—	7
break-thru	103	93	94	103	102	93	103	—	101	96	8
DK 122	114	71	100	109	119	—	104	—	108	84	7
GH 777	112	—	—	—	—	—	—	—	112	—	1
120	111	113	103	107	103	—	112	107	109	111	10
A-54	105	107	105	102	101	105	104	102	104	106	7
Alpine	110	104	101	106	115	113	—	—	107	107	5
Bolt ML	114	—	—	—	—	—	—	—	114	—	1
Ranger	98	100	125	104	97	99	—	—	100	100	13
Aggressor	100	—	102	—	108	—	100	—	102	—	7
Blazer XL	101	—	106	—	111	—	—	—	105	—	3
Dart	111	107	100	109	108	110	109	105	107	106	9
Milkmaker	106	99	100	93	98	101	104	106	104	100	8
Thrive	103	—	103	—	—	—	106	—	104	—	5
Arrow	108	103	103	95	112	114	110	104	107	104	9
MultiKing 1	103	—	109	—	117	—	—	—	108	—	3
Webfoot	105	105	107	—	103	—	102	107	105	105	8
Zenith	105	—	113	—	114	—	—	—	109	—	3
Acheiva	110	—	—	—	—	—	—	—	110	—	1
Class	113	—	—	—	—	—	—	—	113	—	1
GH 715	106	102	103	107	103	104	113	112	105	105	8
Impact	110	94	104	114	112	104	112	104	108	100	6
Oneida	105	106	102	107	94	97	105	107	100	106	10
Royalty	105	—	98	107	101	107	101	—	102	107	7
Moderately Fall Dormant											
Ultra	102	82	91	104	103	103	114	106	100	93	6
Cutter	103	—	102	—	114	—	106	—	104	—	6
WL 322 HQ	94	—	111	—	96	—	—	—	99	—	3
Agri-MATE	111	82	102	—	99	—	103	—	105	82	6
Husky	110	98	100	97	111	105	103	105	107	99	12
Kingstar	102	87	91	—	104	112	101	102	99	94	7
Oneida VR	101	104	99	109	103	107	105	99	101	105	7
VIP	111	87	95	102	112	104	106	—	105	94	9
WL 317	114	93	92	99	105	111	105	—	103	101	6
Agri-Boss	107	96	84	—	96	101	—	—	102	99	5
Apollo Supreme	110	104	96	105	100	99	107	108	103	105	6
Elevation	112	112	103	106	111	97	105	97	108	107	10
GH 747	108	88	85	105	108	100	—	—	105	94	4

Table 2 (continued). Average yields of alfalfa varieties expressed as percentage of Vernal for all tests with one or more harvest years (1967-1991) in each of four climatological areas within Minnesota.

Variety	Average yield for years 1-2 and 3-4 after seeding per test location										Number tests
	Rosemount & Waseca		Morris & Crookston		Lamberton		Grand Rapids		All locations		
	1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4	
	% of Vernal										
Magnum	106	107	100	105	102	101	95	99	103	107	8
Perry	108	111	98	108	100	102	103	—	103	108	6
2833	109	—	94	109	104	101	—	—	102	105	5
5432	109	105	100	108	101	100	104	114	104	106	6
Commandor	109	105	93	94	103	101	103	101	105	102	7
Flint	100	104	98	102	105	108	—	—	100	105	6
Endure	107	100	104	103	103	113	110	94	106	103	7
Fortress	102	77	80	93	106	89	103	—	100	84	8
Jade	118	109	118	—	115	—	109	—	115	109	6
Quest	104	96	112	—	111	—	—	—	109	96	3
2841	97	76	89	91	108	103	104	—	99	87	7
Apollo II	103	93	103	95	103	95	103	84	103	94	8
Chief	102	86	93	110	102	100	109	98	100	94	7
DK 125	107	95	98	93	123	110	104	89	106	97	7
DK 133	107	—	—	—	—	—	—	—	107	—	1
DK 135	105	94	96	107	102	100	102	85	102	97	7
GH 737	110	92	95	82	110	109	99	95	104	95	7
Legend	97	104	96	—	101	91	101	—	98	100	6
Multi-plier	108	—	99	103	103	83	97	—	103	93	8
Saranac	103	97	103	109	103	103	96	109	103	101	27
Stein 9227	102	—	115	—	—	—	—	—	107	—	2
Target II	110	88	108	—	—	—	105	—	110	88	4
Trident	106	112	97	98	103	—	97	96	102	106	8
RamRod	110	106	105	111	113	104	—	—	109	106	4
Voyager	113	99	100	118	103	108	107	116	107	107	6
630	111	110	101	98	107	109	99	112	107	109	7
5333	94	—	105	—	103	—	—	—	99	—	3
Bronco	116	94	92	91	101	91	103	—	101	92	6
Allegiance	95	101	99	108	110	118	105	—	100	107	7
Dynasty	110	98	97	84	99	94	105	112	103	98	6
Gourmet Hay	102	—	116	—	104	—	—	—	106	—	3
Magnum III-Wet	—	—	—	—	—	—	—	—	—	—	—
Vector	105	107	100	99	104	109	103	—	103	105	6
Verta +	106	96	99	93	96	95	105	96	101	95	6
5364	116	113	96	108	104	107	98	—	102	109	6
Aquarius	99	90	99	89	—	—	—	—	99	89	5
Sure	109	97	99	106	103	100	101	105	104	101	6
Crown	109	100	93	101	123	112	113	103	108	104	6
GH 755	111	—	—	—	—	—	—	—	111	—	1
Good as Gold	109	—	114	—	113	—	108	—	111	—	6
Promise	113	99	87	95	108	107	107	—	103	101	6
WL 320	109	110	106	97	112	106	112	102	108	106	6
Crown II	112	—	103	109	111	108	—	—	108	108	6
Hi-Phy	111	127	100	100	103	—	99	102	105	114	7
New Era 90	105	70	80	104	99	91	—	—	99	83	3
Pro-Cut 2	111	88	92	92	110	106	100	—	101	96	6
Terminator	105	100	95	101	106	110	102	—	101	103	6
Magnum +	106	107	101	102	107	105	104	107	104	107	7
Magnum III	110	101	106	106	119	110	104	107	108	103	7
Pro-Cut	96	82	91	101	98	97	93	—	94	89	6
EMPRESS	117	73	104	—	106	—	104	—	108	73	6
2852	108	90	102	92	105	100	109	102	106	93	7
Cimarron	104	87	94	92	111	113	108	80	103	93	7
Belmont	94	—	107	—	96	—	—	—	98	—	3
Cimarron VR	96	—	91	—	111	—	100	—	99	—	6

[1] Order of entries in this table parallels fall growth score order of table 1.

BIRDSFOOT TREFOIL

Birdsfoot trefoil is an excellent nonbloating pasture legume which can also be harvested for hay and silage. It grows under a wide range of soil conditions. It also persists longer and performs better than other legumes under poor soil conditions such as low fertility, acidity and poor drainage. It is persistent when grown with Kentucky bluegrass and timothy.

Eight birdsfoot trefoil varieties were established in pure stands in August, 1989 on Minnesota Agricultural Experiment Station fields at Rosemount and Grand Rapids. However, severe winter injury at Grand Rapids destroyed the trial at that location.

The Rosemount trial was harvested twice in 1990 and three times each in 1991 and 1992. Dry matter yields in 1992 were excellent and similar to the yields obtained in 1991. These yields were higher than anticipated for birdsfoot trefoil and may be partly attributed to both a lack of winter injury and the presence of a cool, moist growing season in 1992. New performance trials of birdsfoot trefoil were established at Rosemount and Grand Rapids in 1992.

Table 3. Winter injury score (1990) and dry matter yield (1990–92) of birdsfoot trefoil varieties seeded in 1989 at Rosemount.[1]

Variety[2]	Winter injury	Forage Yields 1990	1991	1992	Mean
	score[3]	tons DM/A			
Bonnie	3.2	3.9	5.0	4.6	4.5
Carroll	1.0	5.6	5.8	5.6	5.2
Dawn	3.0	5.0	5.8	5.4	5.4
Empire[BIOegijorsz]	3.7	4.6	5.0	5.3	5.0
Fergus	1.5	4.9	5.3	5.8	5.3
GA-1	5.0	NH[4]	NH	NH	NH
Leo[rz]	2.7	4.4	5.0	5.1	4.8
Norcen[BIdegijorsz]	1.5	5.2	5.3	5.7	5.4
LSD 5%	1.0	0.8	0.6	0.8	0.5

[1] Trial established in 1989 at Rosemount, MN; [2] 1993 seed sources are listed at the end of the forage crops section; [3] Score: 1 = no injury to 5 = dead on May 18, 1990; [4] NH: not harvested.

Winter-hardy varieties such as Carroll, Norcen, and Dawn produced the highest overall yields. Norcen was released in 1983 by the agricultural experiment stations of Minnesota and six other states and has performed exceptionally well in grazing trials.

ORCHARDGRASS

Orchardgrass is often used in hay and pasture mixes with other grasses and legumes because it establishes rapidly and recovers quickly after grazing or harvesting. Its major limitation is its lack of winter hardiness, but it can persist and remain productive in areas with reliable snow cover.

Orchardgrass varieties were established

Table 4. Winter injury (1990), maturity (1992) and dry matter yield (1990-1992) of orchardgrass varieties seeded at two locations.[1]

Variety[2]	Winter Injury: Grand Rapids	Winter Injury: Rosemount	Maturity	Forage Yield: Grand Rapids 1990	Grand Rapids 1991	Grand Rapids 1992	Rosemount 1990	Rosemount 1991	Rosemount 1992	Mean
	score[3]		rating[4]	tons DM/A						
Ambassador[UZ]	2.6	1.8	7.9	4.6	2.6	2.6	5.4	4.5	4.2	4.0
Crown[diz]	2.4	1.5	6.8	4.6	2.7	2.6	5.1	4.5	4.1	3.9
Dawn[I]	2.3	2.0	4.5	4.7	2.9	2.6	5.5	4.4	3.8	4.0
Elsie	2.3	2.0	6.8	4.6	2.9	2.2	5.4	4.8	4.1	4.0
Justus[UZ]	2.8	3.6	6.0	4.5	2.4	2.3	5.2	4.6	4.2	3.9
Napier	2.4	2.0	7.0	5.0	2.9	2.5	5.0	4.5	4.3	4.0
Orbit	2.5	2.3	3.8	4.3	2.6	2.6	5.0	4.4	4.1	3.8
Orion[I]	2.6	1.0	4.3	4.8	2.9	2.7	5.8	4.9	4.3	4.2
Potomac[BOeghijoretx]	2.0	1.5	8.5	4.4	2.6	2.4	5.2	4.3	4.0	3.8
Shawnee	2.4	3.8	5.3	4.6	2.4	2.2	5.2	4.4	3.9	3.8
Sterling	2.1	2.3	7.5	4.1	2.4	2.7	5.4	4.6	4.5	4.0
LSD 5%	0.6	0.8	1.7	NS	NS	0.3	0.5	0.5	0.5	0.2

[1] Trials established in 1989 at both locations; [2] 1993 seed sources are listed at the end of the forage crops section; [3] Score: 1 = no injury to 5 = dead; scored May, 1990; [4] Rating: 0 =no panicle emergence to 9 = complete panicle emergence; scored June 2, 1992 at Rosemount.

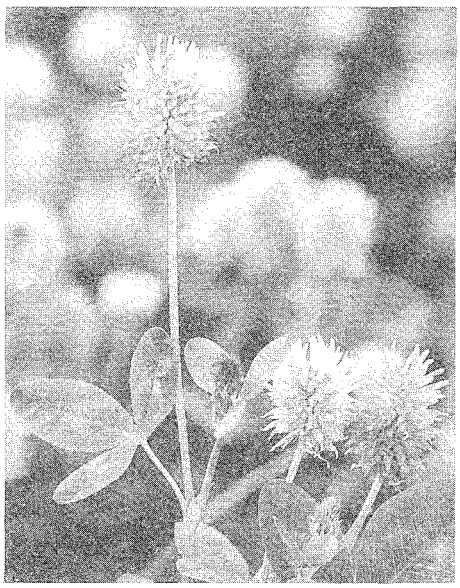
in pure stands in August, 1989, at Rosemount, Grand Rapids and Morris. Severe winter injury at Morris destroyed the trial at that location.

Experimental plots were typically harvested three times from 1990 to 1992. The Grand Rapids stand was only harvested twice in 1992. Nitrogen was applied both in the early spring and after each harvest at a rate of 40 to 50 lbs N/acre. Few differences were observed for forage yield at both locations.

Varieties which showed significant winter injury in May, 1990 produced adequate forage yields during the 1990 growing season. Yields were lower in 1991 and 1992 than 1990, especially at Grand Rapids. In 1992, differences in forage yield were found between varieties tested at both locations. Orion, a winter hardy variety, was the highest yielding variety averaged over all locations and years. The newer varieties Ambassador, Dawn and Elsie, and the older Napier and Sterling varieties, all performed well in the trial.

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, winter-hardy varieties have not persisted beyond two crop years because they are susceptible to diseases. Most improved varieties currently sold in Minnesota can persist for three years if they have good winter snow cover.



Minnesota Agricultural Experiment Station scientists established performance trials of red clover in 1991 at three locations but stands were sufficient for data collection only at Grand Rapids and Rosemount in 1992. The trial was harvested three times at Rosemount and twice at Grand Rapids in 1992. No differences in dry matter were found between the varieties at either location at any harvest date. Yields and stands were better at Rosemount than Grand Rapids.

Table 5. Percent stand and dry matter yield of red clover varieties seeded at two locations.[1]

Variety[2]	Stand[3]	Forage Yield (1992)		Mean
		Grand Rapids	Rosemount	
	%	tons DM/A		
Acclaim	79	3.2	5.4	4.3
Arlington[Begijnorsxz]	55	2.9	5.1	4.0
Marathon[deghinorstz]	68	2.9	5.1	4.0
Red Star[l]	68	3.1	5.3	4.2
LSD 5%	21	NS	NS	NS

[1] Trials established in 1991 at both locations; [2] 1993 seed sources are listed at the end of the forage crops section; [3] Percent stand rated at Grand Rapids on June 9, 1992.

REED CANARYGRASS

Reed canarygrass is adapted throughout Minnesota for use as hay, pasture and silage. It is one of the best grass species for poorly drained soils; it tolerates flooding better than other cool season grasses. The species uses nitrogen efficiently and is adapted to liquid manure application. Seedling vigor of reed canarygrass is not as good as other commonly used forage grasses.

Prior to 1985, common reed canarygrass had been described as being less palatable than most other grass species seeded for hay and pasture. Cattle produced well on the grass only if it was grazed when it was between 6 and 24 inches tall.

The latest development in reed canary-

Table 6. Dry matter yields (1990-1992) of reed canarygrass varieties seeded at two locations.[1]

Variety[2]	Morris			Rosemount			Mean
	1990	1991	1992	1990	1991	1992	
	tons DM/A						
Palaton[Bldijnor]	5.1	2.7	3.6	8.8	6.8	5.1	5.4
Rise	5.4	2.9	3.8	7.5	6.3	4.8	5.1
Vantage	5.7	2.7	3.7	8.3	5.9	4.6	5.2
Venture[Bjnr]	6.0	2.9	3.9	9.2	6.6	5.6	5.7
LSD 5%	0.9	NS	NS	1.2	0.8	0.7	0.3

[1] Trials established in 1989 at both locations; ; [2] 1993 seed sources are listed at the end of the forage crops section

grass breeding has been the release of varieties low in indole alkaloid concentration. This dramatically improves animal performance and palatability. In grazing trials, lambs and steers gained more weight and sheep had less diarrhea on low alkaloid varieties than on common reed canarygrass. Hay should be harvested between heading and early bloom because quality declines with maturity.

Reed canarygrass trials were established in pure stands in 1989 at Morris and Rosemount. The trial was harvested twice at Morris and three times at Rosemount in 1990, 1991 and 1992. Nitrogen was applied at each site early in the spring and after each harvest at a rate of 40 to 50 lbs N/acre. Available varieties are winter-hardy and persistent in Minnesota. Palaton and Venture are high yielding, low alkaloid varieties currently marketed in Minnesota.

TALL FESCUE

Tall fescue is a bunchgrass and may be planted 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. Animal performance is better when the variety grown is endophyte-free. Tall fescue is subject to winter injury, but may remain productive in areas with reliable snow cover.

Minnesota Agricultural Experiment Station scientists initiated a new series of performance trials of tall fescue in 1992 at three locations. Data collection from these trials will start in 1993, but if you want information from a recent report of other tests of this crop, contact Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108.

TIMOTHY

Timothy is adapted throughout Minnesota for use in hay and pasture mixes. When timothy is the major component in hay, its stage of maturity affects both the yield and quality of the hay. Harvesting timothy at early heading is the preferred time. Timothy produces the majority of it's forage at the first harvest.

Timothy varieties differ in maturity so care should be taken in choosing varieties that fit the management requirements of a crop and mixture. Early varieties are best adapted to a three-cut system with alfalfa.

Varieties that are intermediate to late maturing should not be harvested more than twice during the growing season. Therefore, appropriately selected timothy varieties are compatible with red clover and birdsfoot trefoil in mixtures for hay production.

Varieties in the timothy trials were established in pure stands in August, 1989, at Grand Rapids and Rosemount. Two harvests were taken during 1990 and 1991 at both locations and in 1992 at Rosemount. The timothy stands did not persist at the Grand Rapids and could not be harvested in 1992.

Nitrogen was applied at a rate of 40 to 50 lbs N/A at all locations, both in the early spring and after each harvest. Early maturing varieties had greater forage production than the late maturing varieties at both locations over all harvest years. At Rosemount, the yields of timothy were exceptionally high for the third production year and may be partly attributed to a mild winter, and to abundant rainfall and cool temperatures during the 1992 growing season. Timothy is normally less persistent than other cool-season grasses such as reed canarygrass.

Timothy plants, wind pollinated, shed their pollen from extended anthers.

Table 7. Dry matter yield (1990-1992) of timothy varieties seeded at two locations.[1]

	Grand Rapids[3]		Rosemount			
Variety[2]	1990	1991	1990	1991	1992	Mean
	tons DM/A					
Early Maturity						
Chazy	4.0	2.6	3.8	4.8	4.2	3.9
Tupper	4.0	2.4	3.6	4.7	4.8	3.9
Intermediate Maturity						
Comtal	3.6	2.4	3.5	4.3	4.9	3.6
Climax	3.6	2.4	2.9	4.4	4.4	3.5
Goliath	3.3	2.4	3.7	4.3	4.3	3.6
Late Maturity						
Champlain	3.2	2.4	3.1	4.4	3.9	3.4
Heidemij	2.7	2.2	2.6	3.5	4.1	3.0
LSD 5%	0.4	0.2	0.8	0.4	0.5	0.2

[1] Trials established in 1989 at both locations; [2] 1993 seed sources are listed at the end of the forage crops section; [3] Stands had deteriorated at Grand Rapids allowing only two years of data collection.

CROP NOT IN CURRENT TRIALS

Smooth Bromegrass

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

Minnesota Agricultural Experiment Station scientists are not currently conducting performance trials of bromegrass. For information from a recent report of tests of this crop, contact Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108.

Seed Sources for the varieties sold in Minnesota are listed in Crop News No. 42 (revised), January 1991, prepared by Neal P. Martin, Extension Agronomist-forages.

1992 FORAGE SEED SOURCES

A. ABI, 6700 Antioch, Shawnee Mission, KS 66201;
B. Agassiz Seeds, 4121-1/2 S. University Drive, Fargo, ND 58104;
C. AgriPro, 824 2nd St. South, P.O. Box 250, Brookings, SD 57006;
D. Allied Seed Cooperative, 1917 E. Fargo, Nampa, ID 83687;
E. Americas Alfalfa Distributors, 6700 Antioch, Shawnee Mission, KS 66201;
F. Bio Plant Research, P.O. Box 300, Camp Point, IL 62320;
G. Blaney Seeds, Inc., 5292 East Lacy Drive, Madison, WI 53711;
H. Cargill Seed Div., P.O. Box 5645, Mpls., MN 55440;
I. Cenex/Land O'Lakes, Station 680, P.O. Box 64089, St. Paul, MN 55164-0089;
J. CIBA-GEIGY Seed Div., P.O. Box 18300, Greensboro, NC 27419-2900;
K. CropMate Co., P.O. Box 978, Pekin, IL 61555;
L. Custom Farm Seed, Box 160, Momence, IL 60954;
M. Dahlgren & Co., Inc., Box 609, 1220 Sunflower Street, Crookston, MN 56716-0609;
N. Dairyland Seed Co., Inc., R.R. #1, P.O. Box 129, Clinton, WI 53525;
O. Dammann Seed Farms, 3374 80th St., Plato, MN 55370;
P. DeKalb Plant Genetics, 3100 Sycamore Rd., DeKalb, IL 60115;
Q. Discount Farm Center, Inc., P.O. Box 84, West Hwy 212, Watertown, SD 57201;
R. DSM, Box 296, Madison Lake, MN 56063;
S. FFR Cooperative, 4112 East St. Rd. 225, West Lafayette, IN 47905;
T. Fred Gutwein & Sons, Inc., R.R. 1, Box 40, Francesville, IN 47946;
U. Geertson Seed Farms, 1665 Burroughs Rd. Adrain, OR 97901;
V. Golden Seed, 27420 137th Ave. North, Cordova, IL 61242;
W. Great Lakes Hybrids, P.O. Box 637, 9915 West M-21, Ovid, MI 48866;
X. Great Plains Research Co, Inc., 3624 Kildaire Farm Rd., Apex, NC 27502;
Y. ICI Seeds, 6945 Vista Drive, West Des Moines, IA 50266;
Z. International Seeds Inc., P.O. Box 168, Halsy, OR 97348;
a. Interstate Seed Co., P.O. Box 338, West Fargo, ND 58078;
b. J.C. Robinson Seed Co. (Golden Harvest), 100 J.C. Robinson Blvd., Waterloo, NE 68069;
c. Jacques Seed Co., 720 St. Croix, Prescott, WI 54021;
d. Jung Farms Inc., 335 South High Street, Randolph, WI 53957;
e. Kaltenberg Seed Farms, Inc., P.O. Box 278, Waunakee, WI 53597;
f. Keltgen Seed Co., Box A, Olivia, MN 56277;
g. LaCrosse Seed Corporation, P.O. Box 187, LaCrosse, WI 54602-0187;
h. L. Herried Seeds, Inc., P.O. Box 216, Prescott, WI 54021;
i. L.L. Olds Seed Co., Box 7790, Madison, WI 53707-7790;
j. Lincoln Seed, Inc., 5600 Harbor Drive, P.O. Box 2803, Sioux City, IA 51106;
k. NC+ Hybrids, P.O. Box 4408, Lincoln, NE 68504;
m. Northrup King Co., P.O. Box 959, 7500 Olson Memorial Hwy., Golden Valley, MN 55427;
n. Peterson Seed Co., Inc., P.O. Box 346, Savage, MN 55378;
o. Peterson-Biddick Co., Box 190, 102 Aldrich S.E., Wadena, MN 56482;
p. Pioneer Hi-Bred Int'l, Inc., P.O. Box 287, 7305 N.W. 62nd Ave., Johnston, IA 50131;
q. Prairie Gold, County Rd. 13, Box 226, Olivia, MN 56277;
r. Premium Seed Co., Inc., 7800 E. State Hwy 101, Shakopee, MN 55379;
s. Ramy Seed Company, 1329 N. Riverfront Drive, Mankato, MN 56001;
t. Renk Seed Company, 6800 Wilburn Rd., Sun Prairie, WI 53590;
u. SIGCO Research, P.O. Box 289, Breckenridge, MN 56520;
v. Stine Seed Farm, Inc., 2225 Laredo Trail, Adel, IA 50003;

w. The Sexauer Co., P.O. Box 58, Brookings, SD 57006;
x. Top Farm Hybrids, Inc., Box 850, Cokato, MN 55321;
y. Trelay, Inc., Route 1, Livingston, WI 53554;
z. Werner Farm Seeds, 3104 Millersburg Blvd., Dundas, MN 55019;
Δ. Wilbur-Ellis Co., 706 E. Second St., Janesville, MN 56048;
Φ. Ziller Seed Co., R.R.1, Box 122, Bird Island, MN 55310-9730.

GRAIN CROPS

BARLEY

Recommended public varieties

Excel--High yield. Medium maturity. Similar to Robust in lodging resistance. Kernel plumpness lower than Robust. Six-rowed, semi-smooth awn, colorless aleurone. Excel's long rachilla hairs enable its grain to be distinguished from grain of Robust and Morex. Classified as a malting variety by AMBA. Resistant to spot blotch. Developed by the Minnesota Agricultural Experiment Station from crosses involving Robust, Manker, and a sisterline of Morex. Released 1990. Seed sale regulated by U.S. Variety Protection Act.

Robust—Medium yield and maturity. Good lodging resistance and kernel plumpness. Six-rowed, semi-smooth awn, short rachilla hairs, colorless aleurone. Classified as a malting variety by AMBA. Resistant to spot blotch. Developed by Minnesota Agricultural Experiment Station from cross of Morex and Manker. Released 1983. Seed sale regulated by U.S. Variety Protection Act.

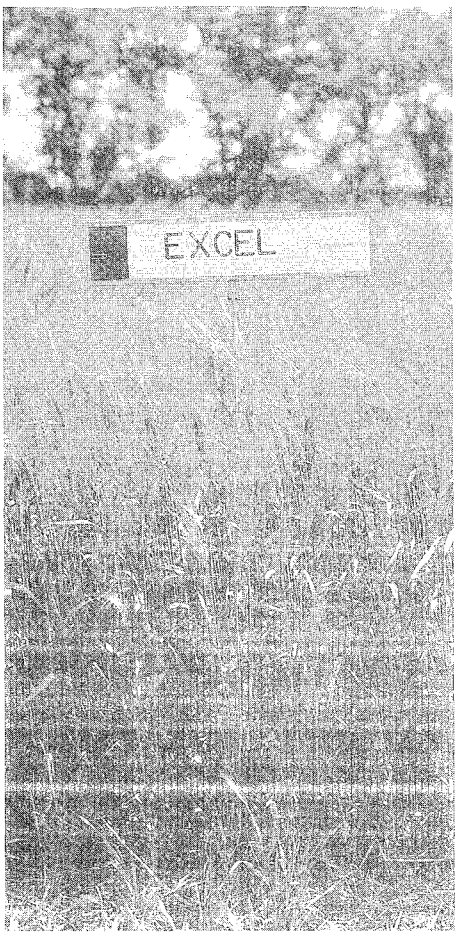
Other public varieties

Azure—Medium yield and maturity. Six-rowed, semi-smooth awn, long rachilla hairs, blue aleurone. Classified as a malting variety by AMBA. Resistant to spot blotch. Yielded similar to Robust in Minnesota trials. Variety is not recommended because of limited demand for a blue aleurone malting variety in Minnesota. Developed by the North Dakota Agri-cultural Experiment Sta-

Table 8. Yields of barley varieties.[1]

Variety	Location					
	Crookston	Morris	Stephen	St. Paul	Roseau	Mean
1992			bu/A			
Number of trials:	5	3	—	3	1	12
Morex	100	95	—	95	109	98
Robust	109	103	—	104	109	106
Excel	125	123	—	117	124	122
LSD 5%	7	8	—	10	16	5
1986-1992			bu/A			
Number of trials:	6	7	3	7	1	24
Morex	85	70	66	82	52	76
Robust	93	76	62	87	61	81
Excel	99	78	75	93	56	86
B1602	91	73	66	89	62	81
LSD 5%	6	5	10	4	9	2
1985-1992			bu/A			
Number of trials:	15	13	5	14	5	52
Morex	85	72	74	73	69	76
Robust	90	79	72	79	82	82
Excel	94	82	81	82	87	86
LSD 5%	3	3	6	4	7	2

[1] Barley grain yields are presented separately as current year and multi-year groupings; year to year performace of varieties vary widely.



Excel is the most recent superior quality, high yielding malting barley released by the Minnesota Agricultural Experiment Station.

tion from a cross involving Bonanza, Nordic, and ND B130. Released 1982.

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

Morex—Low yield. Early maturity. Susceptible to lodging. Intermediate kernel plumpness. Six-rowed, semi-smooth awn, short rachilla hairs, colorless aleurone. Awns may drop off as crop approaches maturity. Threshes easily. Classified as a malting variety by AMBA. Moderately resistant to spot blotch. Developed by Minnesota Agricultural Experiment Station from cross of Cree and Bonanza. Released 1978.

Table 9. Characteristics of barley varieties, 1986-91.

Variety	Heading 19[1]	Height 18	Lodging 8	Plump Kernels 23	Net Blotch 8
	date	inches	%	%	score[2]
Morex	6-19	33	45	69	4.2
Robust	6-21	33	36	76	3.2
Excel	6-21	31	39	63	3.2

[1] Number of trials; [2] Rating 1 = resistant, 5 = susceptable.

Privately developed varieties

B1602—Medium yield. Similar to Robust in maturity and lodging resistance. Kernel plumpness lower than Robust. Six-rowed, rough awn, long rachilla hairs, colorless aleurone. Resistant to spot blotch. Classified as a malting variety by Anheuser Busch Inc., but not by AMBA. Developed and marketed by Busch Agricultural Resources Inc. Parents include Bumper and Morex. Released 1989.

OAT

Crown rust infection dramatically increased in many Minnesota oat fields during 1990 and 1991, and at least three new races have been identified over the last several years. As a result, varieties previously considered to have good crown rust resistance are now quite vulnerable. Varieties with limited or no rust resistance should be grown with caution.

Recommended varieties

Dane—Early maturity, very high yield, short, good lodging resistance, medium test weight, very high groat percentage, yellow seed. Moderately resistant to crown rust, moderately susceptible to smut and susceptible to red leaf. Selected at the Wisconsin Agricultural Experiment Station. Released 1990. Foundation Seed available to Certified Seed producers only under a license/fee collection agreement. Application for Plant Variety Protection Certificate has been submitted.

Don—Early maturity, high yield, short, fair lodging resistance, high test weight, high groat percent, low protein percent, white seed. Some resistance to crown rust and smut. Selected at the Illinois Agricultural Experiment Station. Released 1985.

Hazel—Medium maturity, high yield, short, very good lodging resistance, high test weight, very high groat percent, medium protein percent, ivory seed. Moderately 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 1985. Because of smut susceptibility, planting only treated seed is recommended.

Troy—Late maturity, very high yield, tall, very high test weight and high groat percent, white seed. Very good crown rust resistance, resistant to smut and good tolerance to red leaf. Selected at the South Dakota Agricultural Experiment Station. Released 1991.

Valley—Late maturity, high yield, short, good lodging resistance, high test weight and groat percent, medium protein percent, ivory seed. Some resistance to crown rust, susceptible to smut. Selected at North Dakota

Table 10. Oat yield by location, 1990–92.

Variety	Rosemount	Waseca	Lamberton	Morris	Crookston	Grand Rapids	6 loc. ave.	Roseau	Stephen[1]	Winona[2]
	bu/A									
Dane	92	89	88	88	96	90	90	104[2]	86[2]	57
Don	90	77	79	89	100	86	86	86	84	57
Hazel	93	84	86	88	95	87	87	105	86	57
Premier	71	75	73	82	101	80	80	85	78	57
Settler	78	83	74	95	101	84	84	99	96	70
Armor[2]	110	86	61	90	87	100	89	86	124	—
Prairie[2]	112	95	71	91	97	102	95	106	143	81
Valley	75	77	75	101	112	89	89	84	112	76
Troy	96	104	85	105	99	87	96	104	89	63
LSD 5%	10	9	10	8	9	10	4	14	17	15

[1] 1991-92 data; [2] 1992 only.

Agricultural Experiment Station. Released 1988. Because of smut susceptibility, planting only treated seed is recommended.

Varieties not adequately tested

Armor—Medium-late maturity, high yield, medium height, good lodging resistance, poor test weight and groat percentage, yellow seed. Some resistance to crown rust and smut, tolerant to red leaf. Selected at the Ohio Agricultural Experiment Station. Released 1992.

Ensiler—Late maturity, poor grain yield but excellent forage yield, tall, poor lodging resistance. Resistant to crown rust and smut, some tolerance to red leaf. Selected at the Wisconsin Agricultural Experiment Station from a cross involving Lodi and Otee. Released 1990. Foundation Seed available to Certified Seed producers only under a license /fee collection agreement. Application for Plant Variety Protection Certificate has been submitted. *For forage only.*

Prairie—Medium-late maturity, very high yield, good lodging resistance, medium test weight, high groat percentage, white seed. Moderately resistant to crown rust, susceptible to smut, very tolerant to red leaf. Selected at the Wisconsin Agricultural Experiment Station. Released 1992. Foundation Seed available to Certified Seed producers only under a license/fee collection agreement. Application for Plant Variety Protection Certificate has been submitted. Because of smut susceptibility, planting only treated seed is recommended.

Other varieties

Horicon--Medium maturity, high yield, medium height, very good lodging resistance, medium test weight, high groat percent, medium protein percent, tan seed. Resistant to crown rust, susceptible to smut, some tolerance to red leaf. Selected at the Wisconsin Agricultural Experiment Station from a complex cross. Released 1989. Foundation Seed available to Certified Seed producers only under a license/fee collection agreement. Application for Plant Variety Protection Certificate has been submitted. Because of smut susceptibility, planting only treated seed is recommended.

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

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

Newdak—Medium maturity, high yield, short, fair lodging resistance, medium-poor test weight and groat percentage, white seed. Some resistance to rust, susceptible to smut, good tolerance to red leaf. Selected at North Dakota Agricultural Experiment Station. Released 1990. Because of smut susceptibility, planting only treated seed is recommended.

Ogle—Medium maturity, high yield,

Side-by-side experiment station trials show differing growth characteristics of oat varieties.

Table 11. Characteristics of oat varieties, 1990–92.

Variety	Heading	Height	Lodging Score[1]	Test Weight	Groat	Reaction to Disease		
						crown rust[2]	smut[2]	BYDV[3,4]
	date	inches	(1-5)	lbs/bu	percent	rating		
Dane	6/19	34	1.3	36.4	74.2	MR	MR	7.0
Don	6/21	34	1.6	37.0	72.6	MR	MR	7.0
Hazel	6/20	35	1.2	36.4	72.8	MR	S	3.5
Premier	6/23	37	1.5	36.7	71.9	S	HR	5.0
Setter	6/24	39	2.2	36.1	71.0	MR	S	4.0
Armor[4]	6/23	37	1.4	34.2	69.3	S	MS	4.0
Prairie[4]	6/25	37	1.8	36.0	72.2	MS	S	2.5
Valley	6/27	37	1.8	36.8	71.8	MR	S	4.5
Troy	6/27	42	2.0	39.4	72.6	MR	HR	4.0

[1] 1 = erect, 5 = flat; [2] 1992 only. HR = highly resistant; MR = moderately resistant; MS = moderately susceptible; S = susceptible; [3] 1 = resistant, 9 = dead; data supplied by F. Kolb and A. Hewings, Univ. of Illinois and USDA-ARS; [4] 1992 only.

medium height and test weight, good lodging resistance, 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 cross of Brave, Tyler and Egdolon. Released 1981. Because of smut susceptibility, planting only treated seed is recommended.

Premier—Medium maturity, yield and height, good lodging resistance, medium test weight, groat percentage and protein percent, yellow seed. Susceptible to crown rust, resistant to smut, some tolerance to red leaf. Selected at the Minnesota Agricultural Experiment Station from a cross between Noble and an unreleased Wisconsin line. Released 1990. Application for Plant Variety Protection has been submitted.

Preston—Early maturity, medium yield, short, fair lodging resistance, high test weight, medium groat percent, very 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 1982.

Rodney—Late maturity, 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 1952. Because of smut susceptibility, planting only treated seed is recommended.

Settler—Medium-late maturity, medium yield and height, poor lodging resistance, medium test weight and groat percent, medium protein percent, white seed. Some resistance to crown rust and smut and some tolerance to red leaf. Selected at the South Dakota Agricultural Experiment Station from a cross involving Benson and Noble. Released 1989.

Starter—Early maturity, medium yield, short, fair lodging resistance, high test weight and groat percent, medium protein percent, yellow seed. Susceptible 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 1986. Seed sale regulated by U.S. Variety Protection Act. *Well suited for companion cropping.*

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

WHEAT (DURUM)

Publicly developed varieties are classed into either "recommended," or "other varieties" categories. Privately developed varieties are listed as a single group.

Recommended publicly developed varieties

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

Renville—Awned, midseason to late, and fair lodging resistance. Resistant to stem rust and moderately resistant to leaf rust. High yield and test weight, and medium kernel weight. Superior quality for export market. Released by North Dakota Agricultural Experiment Station 1988.

Other public varieties

Lloyd—Awned, midseason to late, semidwarf and good lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. Susceptible to glume blatch. High yield, low test weight and low seed weight. Superior quality for export market. Better adapted to northern Minnesota. Released by North Dakota Agricultural Experiment Station 1983.

Medora—Awned, early, medium height

Table 12. Characteristics of durum wheat varieties, 1990–92.

Variety	Heading	Height	Lodging	Rust Reaction		Test Weight	Yield			State Mean
				stem	leaf		Morris[3]	Crookston[3]	Stephen	
	date	inches	score[1]	rating[2]		lbs/bu	bu/A			
PUBLICLY DEVELOPED VARIETIES										
Renville	6-27	37	5.1	MR	R	60.7	61	64	57	60
Cando	6-28	30	1.7	S	R	59.8	51	58	67	60
Monroe	6-24	35	4.9	MR	R	61.2	53	54	56	54
Medora	6-26	39	5.6	MR	R	61.4	55	54	60	57
Vic	6-26	37	5.0	MS	R	61.6	55	59	55	57
Lloyd	6-28	30	2.3	MS	R	58.5	49	59	62	58
Mindum (check)	6-29	43	6.2	MS	S	60.8	44	54	38	44
PRIVATELY DEVELOPED VARIETIES										
Fjord	6-26	37	5.5	MR	R	61.6	51	54	51	52
Stockholm	6-27	30	3.0	MS	R	59.7	46	60	59	54
Laker	6-27	34	2.8	MR	R	60.1	58	57	62	57
LSD 5%							7	—	15	3

[1] 1 = erect, 9 = flat; [2] Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible; [3] 1990 and 1992 data.

and fair lodging resistance. Resistant to stem rust and moderately resistant to leaf rust. High yield and test weight, medium seed weight. Released by Agriculture Canada, Winnipeg, 1980.

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

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

Privately developed varieties

Fjord—Awned, early, medium height and good lodging resistance. Resistant to stem rust and moderately resistant to leaf rust. Medium yield, test weight and seed weight. Released by Agripro 1987. Seed sale regulated by U.S. Variety Protection Act.

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

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

WHEAT (HARD RED SPRING)

Publicly developed varieties are classed into "recommended" and "other varieties" categories. Privately developed varieties are listed seperately. All hard red spring wheat varieties are susceptible to *Fusarium* head blight (scab) unless indicated.

Recommended publicly developed varieties

Butte 86—Awned, early, medium height. Resistant to stem and moderately resistant to leaf rust. Moderately susceptible to scab, tan spot, black chaff, and lodging. High yield and test weight. Medium protein percent. Best adapted south of I-94. Released by North Dakota Agricultural Experiment Station 1986.

Grandin—Awned, early, semidwarf. Resistant to stem rust and leaf rust. Moderately tolerant to loose smut. Good lodging resistance. High yield and test weight. High protein percent. Released by North Dakota Agricultural Experiment Station 1989.

Marshall—Awned, midseason, semidwarf. Resistant to stem rust. Moderately tolerant of loose smut and ergot. Moderately susceptible to leaf rust and scab. Good lodging resistance. High yield and test weight. Low to medium protein percent. Satisfactory milling. Low bake absorption. Released by Minnesota Agricultural Experiment Station and USDA-ARS 1982. Seed sale regulated by U.S. Variety Protection Act.

Minnpro—Awned, midseason, semidwarf. Resistant to stem and leaf rust. Moderately susceptible to loose smut and lodging. High yield, very high protein percent, low test weight. Best adapted to northern Minnesota. Released by Minnesota Agricultural Experiment Station and USDA-ARS 1989. Seed sale regulated by U.S. Variety Protection Act.

Norm—Awned, midseason, semidwarf. Resistant to stem rust and leaf rust. Tolerant to leaf spots. Moderately susceptible to loose smut. Good lodging resistance. Very high yield and test weight. Medium protein percent. Satisfactory milling and baking characteristics. Released by Minnesota Agricultural Experiment Station and USDA-ARS in 1992. Seed sales regulated by U.S. Variety Protection Act.

Prospect—Awned, midseason, semidwarf. Moderately susceptible to stem and leaf spotting diseases. Moderately resistant to leaf rust. Tolerant to loose smut. Good lodging resistance. High yield and test weight. Low to medium percent protein. Low bake absorption. Released by South Dakota Agricultural Experiment Station 1988.

Sharp—Awned, early, medium height. Resistant to stem rust and moderately resistant to leaf rust. High yield and test weight. Medium protein percent. Higher potential for lodging. Best adapted south of I-94. Released by South Dakota Agricultural Experiment Station 1990.

Vance—Awned, midseason, semidwarf. Resistant to stem and leaf rust. Tolerant to loose smut. High yield and medium test weight. Medium protein percent. Best adapted to northern Minnesota. Released by Minnesota Agricultural Experiment Station and USDA-ARS 1989. Seed sale regulated by the U.S. Variety Protection Act.

St. Paul campus wheat research plots are harvested with special small plot equipment.

Other public varieties

Gus—Awned, midseason, semidwarf. Resistant to stem rust and leaf rust. High yield and test weight. Higher potential for lodging. High protein percent. Satisfactory milling and baking. Released by North Dakota

Agricultural Experiment Station 1989.

Roblin—Awnless, very early, medium height. Resistant to stem rust and moderately susceptible to leaf rust. Susceptible to lodging. Medium yield and test weight. High protein percent. Released by Agriculture Canada 1986.

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

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

Privately developed varieties

2370--Awned, early, semidwarf. Moderately resistant to stem and leaf rust. High yield and medium test weight. Good lodging resistance. Medium protein percent. Released by Pioneer Hi-Bred 1989. Sold by North Dakota State Development Foundation 1990. Seed sale regulated by U.S. Variety Protection Act.

2371—Awned, midseason, semidwarf. Resistant to stem rust and leaf rust. Good lodging resistance. Medium yield and low test weight. Medium protein percent. Satisfactory milling and baking quality. Released by North Dakota State University Research Foundation in 1991. Seed sales regulated by U.S. Variety Protection Act.

2375—Awned, early, medium height. Resistant to stem rust and moderately resistant to leaf rust. Tolerant to loose smut. Moderately susceptible to scab. Moderately susceptible to lodging. Very high yield and test weight. Medium to high protein percent. Best adapted south of I-94. Released by Pioneer Hi-Bred in 1988. Sold by North Dakota Development Foundation 1990. Seed sale regulated by U.S. Variety Protection Act.

Bergen—Awned, midseason, semidwarf. Resistant to stem and leaf rust. Very high yield and medium test weight. Low to medium protein percent. Released by Agripro 1990. Seed sale regulated by U.S. Variety Protection Act.

Dalen—Awned, midseason, semidwarf. Resistant to stem rust and leaf rust. Good lodging resistance. High yield and medium test weight. Medium protein percent. First released by Agripro in 1991. Seed sale regulated by U.S. Variety Protection Act.

Fjeld—Awned, midseason, semidwarf. Resistant to stem rust and moderately susceptible to leaf rust. Moderately tolerant of loose smut. High yield, medium test weight. Low protein percent. Lower flour water absorption. Released by AgriPro 1989. Seed sale regulated by U.S. Variety Protection Act.

Krona—Awned, midseason, semidwarf. Resistant to stem rust and leaf rust. Good lodging resistance. High yield and low test weight. Low protein percent. Released by Agripro 1992. Seed sale regulated by U.S. Variety Protection Act.

Nordic—Awned, midseason, semidwarf. Resistant to stem rust and moderately susceptible to leaf rust. Moderately tolerant of loose smut. Medium lodging resistance. High yield and medium test weight. Low protein percent. Marketed by Agripro 1986. Seed sale regulated by the U.S. Variety Protection Act.

Table 13. Yields of hard red spring wheat varieties, 1990–92.

Variety	Crookston[1]	Stephen	Roseau[1]	Northern mean	St. Paul	Morris[2]	Lamberton[3]	Waseca[4]	Southern mean	State mean
	bu/A									
PUBLICLY DEVELOPED VARIETIES										
Butte 86	57	59	53	57	56	59	44	44	51	53
Sharp	62	59	53	58	56	59	45	53	53	55
Grandin	56	62	46	56	58	55	44	37	49	52
Norm	65	69	56	64	60	59	45	44	52	58
Prospect	67	71	48	63	57	59	40	46	50	56
Minnpro	63	68	53	62	48	57	36	36	43	52
Vance	59	66	43	58	52	63	39	41	47	52
Marshall	56	66	43	56	52	55	32	33	43	49
Roblin	49	44	45	46	47	51	37	39	40	43
Stoa	59	62	54	59	55	66	40	46	50	54
Wheaton	61	68	42	59	57	59	39	44	49	54
Gus	64	65	56	62	54	53	37	39	46	54
Chris (check)	43	38	36	39	29	40	30	32	31	35
PRIVATELY DEVELOPED VARIETIES										
2370	62	68	49	61	60	66	43	43	52	56
2375	60	63	52	59	53	63	50	46	52	55
Dalen[2]	60	74	43	61	59	55	32	42	48	55
2371[2]	60	58	36	52	56	61	37	40	48	50
Bergen	63	76	52	65	61	61	39	39	50	57
Fjeld	61	69	46	60	55	59	37	43	48	54
Krona[2]	70	72	43	63	61	64	39	42	51	57
Nordic	70	70	47	64	53	64	35	43	48	55
LSD 5%	NS	13	10	7	12	9	NS	8	6	5

[1] Two year data, 1990 & 1992; [2] 1992 data only; [3] two year data, 1990 & 1991; [4] two year data, 1991 & 1992.

Table 14. Characteristics of hard red spring wheat varieties, 1990--92.

Variety	Heading	Height	Lodging	Rust Reaction stem	Rust Reaction leaf	Test Weight	Wheat Protein	Milling Baking Quality
	date	inches	score[1]	rating[2]		lbs/bu	%[3]	rating
PUBLICLY DEVELOPEDVARIETIES								
Butte 86	6-21	34	3.8	MR	R	58.7	14.9	Medium-High
Sharp	6-21	35	4.4	MR	R	60.6	14.6	Medium-High
Grandin	6-22	34	3.3	R	R	59.3	15.0	High
Norm	6-23	34	3.1	R	R	58.3	14.0	High-Medium
Prospect	6-23	34	3.8	MR	MS	59.0	14.0	Medium-Low
Mimpro	6-24	34	4.2	R	R	58.7	15.5	High-Medium
Vanoc	6-23	34	3.9	R	R	57.0	14.8	Medium-High
Marshall	6-26	33	3.1	MS	R	57.7	13.8	Medium-Low
Roblin	6-20	36	3.6	MS	R	57.0	15.7	High
Stoa	6-24	33	4.6	R	R	58.2	14.6	Medium-High
Wheaton	6-25	32	3.9	R	R	56.0	13.8	Low-Medium
Gus	6-25	35	4.3	R	R	58.4	15.5	High
Chris (check)	6-26	39	6.6	MR	R	57.5	15.4	High
PRIVATELY DEVELOPED VARIETIES								
2370	6-22	32	3.0	MR	MR	58.7	14.3	Medium
2375	6-22	33	4.2	MR	R	59.7	14.6	Medium
Dalen[4]	6-23	32	3.5	R	R	57.4	14.6	Low-Medium
2371[4]	6-23	31	2.7	R	R	56.5	14.8	High
Bergen	6-23	31	3.6	R	R	57.9	13.9	Medium
Fjeld	6-23	32	3.6	MR	R	58.7	13.9	Low-Medium
Krona[4]	6-25	33	3.2	R	R	54.3	13.6	Low
Nordic	6-25	34	4.3	MS	R	57.6	13.0	Low

[1] 1 = erect, 9 = flat; [2] Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible; [3] 12 percent moisture; [4] two year data.

WHEAT (WINTER)

Publicly developed varieties are classed into "recommended" or "other varieties" categories. Privately developed varieties are listed and described seperately.

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

Recommended publicly developed varieties

Arapahoe—Awned, semidwarf, early and good lodging resistance. Winter-hardy. Moderately resistant to leaf rust and resistant to stem rust. High yield and test weight. Released by Nebraska Agricultural Experiment Station and USDA-ARS 1988. Seed sale regulated by U.S. Variety Protection Act.

Roughrider—Awned, tall, medium maturity and fair lodging resistance. Very winter-hardy. Susceptible to leaf rust but resistant to stem rust. Medium yield and high test weight. Satisfactory quality. Released by the North Dakota Agricultural Experiment Station 1975.

Seward—Awned, tall, late, and fair lodging resistance. Very winter-hardy. Moderately susceptible to leaf rust and resistant to stem rust. Very high yield and medium to low test weight. Low protein percent. Satisfactory quality. Released by the North Dakota Agricultural Experiment Station 1987.

Other public varieties

Agassiz—Awned, tall, medium maturity and fair lodging resistance. Very winter-hardy. Susceptible to leaf rust and resistant to stem rust. Medium yield and test weight. Satisfactory quality. Released by North Dakota Agricultural Experiment Station 1985.

Brule—Awned, early, semidwarf with good lodging resistance. Moderately winter-hardy. 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 1982. Seed sale regulated by U.S. Variety Protection Act.

Ross—Awned, medium height, medium maturity and good lodging resistance. Winter-hardy. Moderately susceptible to leaf rust and moderately resistant to stem rust. High yield and test weight. Satisfactory quality. Released by South Dakota Agricultural Experiment Station 1981.

Siouxland—Awned, very early, medium height with medium lodging resistance. Moderately winter-hardy. Moderately resistant to leaf rust and resistant to stem rust. High yield and medium test weight. Released by Nebraska Agricultural Experiment Station and USDA-ARS 1984. Seed sale regulated by U.S. Variety Protection Act.

Privately developed varieties

Abilene--Awned, semidwarf, early and good lodging resistance. Moderately winter-hardy. Moderately resistant to leaf rust and resistant to stem rust. Medium yield and high test weight. Satisfactory quality. Released by

Agripro 1987. Seed sale regulated by U.S. Variety Protection Act.

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

Thunderbird—Awned, early, semidwarf with good lodging resistance. Winter hardiness is not satisfactory. Moderately resistant to leaf rust and moderately susceptible to stem rust. High yield and test weight. Sold by Agripro 1986. Seed sale regulated by U.S. Variety Protection Act.

Table 15. Yield and characteristics of winter wheat varieties, 1990-92.

Variety	Heading	Height	Winter Survival	Lodging	Rust reaction leaf	Rust reaction stem	Test Weight	Protein	Yield Rosemount	Yield Morris	Yield Roseau[5]	Yield Mean
	date	inches	rating[1]	score[2]	rating[3]		lbs/bu	%[4]	bu/A			
PUBLICLY DEVELOPED VARIETIES												
Arapahoe	6-6	35	H	3.1	R	R	58.8	12.6	52	59	23	51
Roughrider	6-9	40	VH	4.0	S	R	59.6	13.0	42	52	31	45
Seward	6-10	40	VH	2.9	MR	R	58.4	11.4	51	60	27	52
Stoutland	6-5	36	MH	3.1	S	R	58.4	12.1	45	58	8	46
Brule	6-6	36	MH	3.2	MS	R	58.5	11.9	46	57	15	46
Rose	6-7	37	H	2.6	S-MS	MR	60.3	12.5	42	57	9	44
Agassiz	6-10	41	VH	4.0	S	R	58.8	12.9	39	44	25	39
Minter (check)	6-10	42	VH	5.0	MS	R	59.2	13.2	36	44	22	37
PRIVATELY DEVELOPED VARIETIES												
Thunderbird	6-4	39	NH	2.6	MR	MS	59.5	12.5	39	55	—	40
Abilene	6-6	33	MH	4.3	MS	MR	58.6	12.9	36	57	—	40
Bighorn	6-7	37	H	3.1	S	S	57.9	12.2	43	56	20	45
LSD 5%									8	11	9	7

[1] VH = very hardy, H = hardy, MH = moderately hardy, NH = not hardy; [2] 1 = erect, 9 = flat; [3] R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible; [4] 12% moisture; [5] 1991 data, severe winterkill in 1990, 1992.

WILD RICE

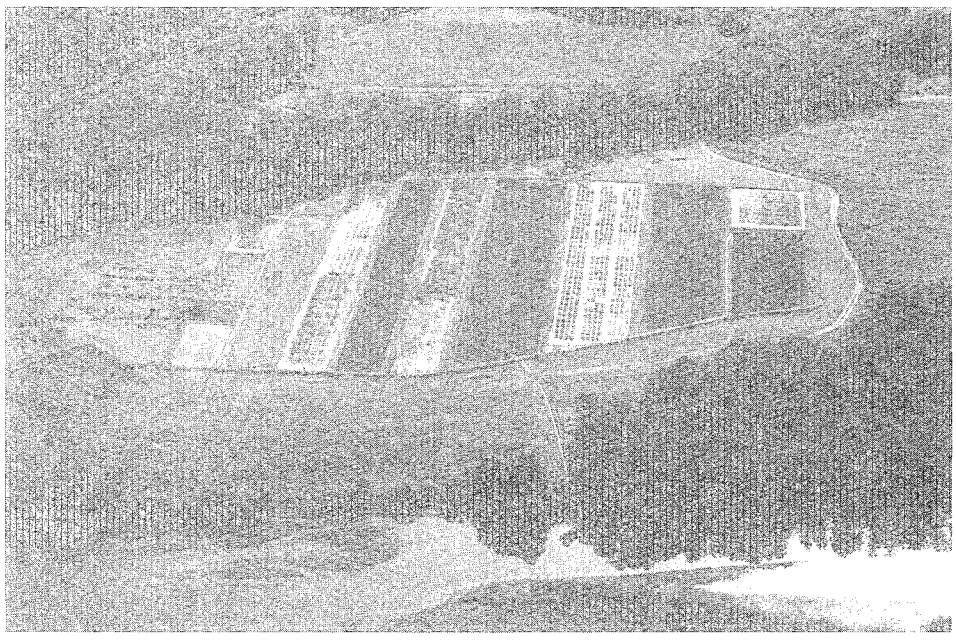
Cultivated wild rice is grown on 20,000 acres in Minnesota. Most wild rice is produced from varieties with nonshattering tendency, but some fields are still planted to shattering types. No recommendations regarding specific varieties are made.

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

Franklin—Medium height, medium to early maturity. More shattering resistant than K2 or other currently grown varieties, especially retaining more seed when harvest is delayed. Released by the Minnesota Agricultural Experiment Station 1992.

K2—Medium height, early to medium maturity, and medium to high yield. Devel-



About half the wild rice research paddies at the Grand Rapids experiment station are used in any year for variety trials and production management research projects.

oped by Kosbau Bros. 1972.

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

Netum—Medium height, early maturity, and low to medium yield. Released by the Minnesota Agricultural Experiment Station 1978.

Petrowske bottlebrush—Medium height, medium to late maturity, and high yield. Up to 50% of plants can have bottlebrush panicle type, depending on continued selection for the trait. Developed by K & D Wild Rice.

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. Released by the Minnesota Agricultural Experiment Station 1983.

Table 16. Yield and seed shattering characteristics of wild rice varieties.

	1991		1992							
	Grand Rapids		Grand Rapids		Gully		Waskish		Mean	
Variety	Yield	Shattering	Yield	Shattering	Yield	Shattering	Yield	Shattering	Yield	Shattering
	lb/A[1]	%[2]	lb/A	%[3]	lb/A	%	lb/A	%	lb/A	%
Franklin	1017	17	1882	—	1266	16	1051	16	1304	16
K2	640	35	2257	—	1368	17	922	23	1297	25
M3	805	39	1455	—	439	51	331	66	758	52
Netum	453	24	—	—	—	—	—	—	—	—
Petrowske bottlebrush	967	32	2174	—	1050	36	809	47	1250	38
Voyager	395	32	2024	—	955	41	639	46	1003	40
LSD 5%	214	9	432	—	314	7	223	9	—	—

[1] Adjusted to 40% moisture; [2] Expressed as a percentage of harvested plus shattered grain.

WINTER RYE

Cultivated rye *(Secale cereale)* is believed to have originated in southern Europe and nearby parts of Asia. Rye was found as a weed widely distributed in wheat and barley fields in southern Asia. It apparently co-evolved with wheat and barley until its value as a separate crop was recognized. Rye was brought to the western hemisphere by the English and Dutch who settled in the northeastern areas of the United States.

Average production of rye in the United States in 1987-89 was about 15.9 million bushels on some 2.3 million acres. The leading states in rye production are South Dakota, Georgia, Nebraska, North Dakota, and Minnesota. In 1930 Minnesota grew 7.2 million acres of rye for grain, while by 1989 only 32,000 acres were harvested. Average yield in 1920 was 17 bushels per acre, while in 1989 it was 34 bushels in the Upper Midwest.

Table 17. Seed yield of winter rye varieties, 1991–92 season.

Variety	Rosemount	Becker	Morris	Mean
	bu/A			
Amando	74	48	—[1]	—
Dacold	78	41	63	61
Dankowski	68	48	65	60
Frederick	64	35	56	51
Halo	68	39	67	58
Kodiak	67	28	56	50
Luchs	57	—[1]	84	—
Marder	—[1]	—[1]	76	—
Mitzi	69	40	76	61
Musketeer	67	43	63	58
Pastar	77	47	68	64
Prima	77	43	76	65
Rapid	49	42	—[1]	—
X79-8	62	35	57	51
LSD 5%	15	9	12	

[1] Plots exhibited severe winter injury; no yield data was collected.

Less than half of the U.S. grown rye is harvested for grain. The rest is used as a pasture, hay, or a cover crop. About half of the amount harvested for grain is used for livestock feed or exported, and the remainder is used for alcoholic beverages, food and seed.

Yield information provided here includes performance of several new hybrids and advanced lines, some with excellent yield potential and winter hardiness. However, the availability of seed of some of these varieties is limited.

Additional production information is provided in the Rye chapter of the *Alternative Field Crops Manual*. Contact your county extension agent or The Center for Alternative Plant and Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108, for details about this publication.

Table 18. Characteristics of winter rye varieties, average of Rosemount and Becker, 1992.

Variety	Winterkill	Height	Lodging	Maturity	Test Weight
	%	inches	score[1]	July	lbs/bu
Amando	14	48	3	13	56
Dacold	1	49	5	12	55
Dankowski	5	53	3	11	58
Frederick	1	56	7	10	56
Halo	21	49	4	13	57
Hancock	—	47	3	17	—
Kodiak	1	59	8	12	53
Luchs	56	42	4	12	55
Marder	86	40	3	14	—
Mitzi	3	54	6	11	56
Musketeer	1	57	8	9	56
Pastar	2	63	7	11	57
Prima	2	57	7	9	57
Rapid	64	46	1	13	55
Rymin	1	40	2	18	—
X79-8	1	62	10	10	56
LSD 5%	10	3	1	2	1

[1] 1 = no lodging, 10 = severe lodging, average of Morris and Rosemount.

Varieties

Amando—Hybrid variety developed by Hybro GbR, Saatzucht Langenbrüken, 7525 Bad Schönborn 2, Germany.

Dacold (ND-1)—Variety developed by North Dakota Experiment Station, Fargo, ND.

Danko (Dankowskie-Nowe)—Developed by DanKow-Laski and Choryn Expt. Stns, Poland. NorFarm Seeds, Inc., Box 725, Bemidji, MN 56601.

Frederick—Variety developed by South Dakota Agricultural Experiment Station. Released 1984.

Halo—Variety developed by F. von Lochow-Petkus GMBH Postfach 1311, 3103 Bergen 1, Germany.

Hancock—Variety developed by Wisconsin Agric. Expt. Stn. Released 1979.

Kodiak—Available from Alberta Wheat Pool, 505 2nd St. SW., Calgary, Canada T2P 2P5.

Luchs—Hybrid rye variety developed by F. von Lochow-Petkus GMBH Postfach 1311, 3103 Bergen 1, Germany.

Marder—Hybrid rye variety developed by F. von Lochow-Petkus GMBH Postfach 1311, 3103 Bergen 1, Germany.

Mitzi—Variety developed by Elliot Plant Breeding, Ottertail, MN.

Musketeer—Variety developed by Agriculture Canada. Licensed in 1980. Production of certified seed limited to Canada.

Pastar—Distributed by NorFarm Seeds, Inc., Box 725 Bemidji, MN 56601.

Prima—Variety developed by Agriculture Canada. Production of certified seed limited to Canada.

Rapid—Hybrid variety developed by Hybro GbR, Saatzucht Langenbrüken, 7525 Bad Schönborn 2, Germany.

Rymin—Variety developed by Minnesota Agricultural Experiment Station. Released 1973.

X79-8—Experimental line developed by the South Dakota Agricultural Experiment Station.

CROPS NOT IN CURRENT TRIALS

Amaranth

Amaranth is a high-protein grain crop for human food. First used by the Aztec civilization, amaranth is currently grown in China, India, and both American continents. Interest in this crop in Minnesota has been increasing in recent years.

Amaranth has large seed heads which can be yellow, green, brown, red, or maroon in color. Plants range from three to nine feet tall, and produce very small, lens-shaped seeds. It is a drought tolerant crop which grows best in warm, dry weather. It is widely adapted to many locations in the Midwest, including Minnesota.

The crop is planted in late May or early June. Cultivation of wide rows is required in the absence of approved herbicides. Seed yields ranging from 300 to 3,800 pounds per acre (hand harvested) have been reported in Minnesota. It is reasonable to expect a yield of between 900 and 1,500 pounds per acre combine harvested. A killing frost followed by a week of drying weather is required before harvest can be accomplished by combine.

A constraint to successfully growing amaranth is finding markets. Amaranth should not be grown without first identifying a market, and preferably establishing a contract for the grain. Amaranth is used in various flour based products. The grain can also be popped like popcorn or flaked like oatmeal. More than 40 products containing amaranth are currently on the market.

Production information is provided in the Amaranth chapter in *Alternative Field Crops Manual*. Contact your county extension agent or the Center for Alternative Plant and Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108 for details about this publication. Additional information is provided in the *Amaranth Grain Production Guide* available from the American Amaranth Institute, Box 216, Bricelyn, MN 56097 (cost: $7.00).

Annual Canarygrass

Annual Canarygrass or canaryseed is a grain crop with production practices and a life cycle similar to spring wheat or oat. The plant is grown on large acreage in the Middle East, Europe and Argentina. There is also some production in the northern Red River Valley of Minnesota, and the western provinces of Canada.

Production in the U.S. developed after World War II in Minnesota and North Dakota, and shifted to Manitoba and later Saskatchewan. In 1987, over 180,000 acres of canarygrass were produced in Canada. Less than 3,000 acres annually have been planted in Minnesota and North Dakota in recent years. It is grown under contract as a specialty

crop, used primarily as birdfeed. The largest users are Japan and other countries of East Asia and Europe.

Minnesota Agriculture Experiment Station scientists are not currently conducting performance trials of annual canarygrass. If you want information from a recent report of tests of this crop, contact Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108.

Production information is provided in the annual canarygrass chapter in *Alternative Field Crops Manual*. Contact your county extension agent or The Center for Alternative Plant & Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108, for details about this publication.

Buckwheat

Buckwheat is a nutritionally excellent grain. USDA-ARS analyses indicate that the grain has an amino acid composition nutritionally superior to all cereals, including oats.

Minnesota Agriculture Experiment Station scientists are not currently conducting performance trials of buckwheat. If you want information from a recent report of tests of this crop, contact Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108.

Production information is provided in the Buckwheat chapter in *Alternative Field Crops Manual*. Contact your county extension agent or The Center for Alternative Plant & Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108, for details about this publication.

Corn

The Minnesota Agricultural Experiment Station conducts research in corn breeding. This includes the development in inbred lines which are used as parents of hybrids. Private companies use these inbreds to produce the hybrid seed corn they develop for farmers.

Hundreds of corn hybrids are registered for sale in Minnesota by private companies. Information on the performance of these closed-pedigree or private hybrids is available from the companies selling them.

Grain Sorghum

Farmers on the hot, dry plains from Texas to South Dakota grow and use grain sorghum like Corn Belt farmers use corn. Large acreage is are also grown in Africa and Asia in areas where the climate is too hot and dry for corn. Acreage in the U.S. has ranged from 15 to 18 million per year. Renewed interest occurs with hotter and drier than normal growing seasons.

Sorghum is a food grain for humans, but in the U.S. is primarily used as feed for livestock. Feed value is similar to corn. Grain sorghum may also be used as whole-plant silage, however, sweet sorghum was specifically developed as a silage crop. Sweet sorghum produces much higher forage yields than grain sorghum, but the feed quality will likely be lower because there is no grain. Some growers plant grain sorghum with soybeans to produce a higher protein silage.

Minnesota Agriculture Experiment Station scientists are not currently conducting performance trials of grain sorghum. If you want information from a recent report of tests of this crop, contact Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108.

Production information is provided in the grain sorghum chapter in *Alternative Field Crops Manual*. Contact your county extension agent or The Center for Alternative Plant & Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108, for details about this publication.

Millet

Millet is among the oldest of cultivated crops. The name is applied to several grass crops whose seeds are harvested for food or feed. Five species have commercial value.

Foxtail millet (*Setaria italica* L.) is primarily grown for hay or silage or as a short season emergence hay crop. In the U.S. it is grown principally in the Dakotas, Colorado and Nebraska.

Proso millet (*Panicum miliaceum* L.) is a component of grain mixes for many birds and as feed for cattle, sheep, hogs and poultry. It is similar to oats and barley in nutritional value and is grown principally in the Dakotas, Colorado and Nebraska.

Barnyard or Japanese millet (*Echinochloa frumentaceae* L.), is a domesticated relative of the barnyard grass weed. In the U.S. it is grown primarily as a forage.

Browntop millet *(Panicum ramosum)* is grown in southeastern U.S. for hay or pasture, and as game preserve bird feed plantings.

Pearl or cattail millet *(Pennisetum glaucum)* It is primarily grown in southern U.S. as a temporary pasture.

Minnesota Agriculture Experiment Station scientists are not currently conducting performance trials of millet. If you want information from the most recent report of tests of this crop, contact Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108.

Production information is provided in the millet chapter in *Alternative Field Crops Manual*. Contact your county extension agent or The Center for Alternative Plant & Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108, for details about this publication.

OILSEED CROPS

CANOLA

Canola (*Brassica napus* or *B. campestris*) is used for edible oil extraction and protein feed meal. Canola oil is considered to be one of the highest quality edible oils available. Considerable acreage of spring canola is currently grown in Canada, and canola is occasionally produced in Minnesota when market prices are high. Interest in canola has increased in recent years with the flexible crop opportunities for minor oilseeds enacted in the 1990 Farm Bill.

Canola is a crop developed from oilseed rape by Canadian plant breeders. The first canola variety was licensed in 1974. Oil in canola seed contains less than 2 percent erucic acid compared with 20 to 40 percent in oilseed rape. High levels of erucic acid in food oils are hazardous to health, and high levels of glucosinolates are detrimental in livestock feeds. Furthermore, the meal remaining after oil extraction from canola contains less than 0.1 percent of glucosinolate (sulfur-containing compounds) compared with about 1 percent in rapeseed meal. Therefore, canola is also referred to as "double low" or "00" rapeseed. Canola is rapidly replacing oilseed rape for food oil and livestock feed.

Variety descriptions that follow are for spring types. Winter canola has been evaluated by University of Minnesota researchers at locations throughout the state, in trials over 15 year/locations, but less than 30 percent of the trials successfully overwintered. Current winter varieties are considered too susceptable for Minnesota's growing conditions.

Production information is provided in the Canola chapter of the *Alternative Field Crops Manual*. Contact your county extension agent or the Center for Alternative Plant and Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108 for details about this publication. "Prospects for Canola in Minnesota" containing detailed information about canola production and processing and is also available.

Table 19. Seed yield of spring canola *(Brassica napus)* varieties.

	1991				1992				1991–92[1]
	Crookston	Morris	Roseau	Mean	Crookston	Morris	Roseau	Mean	Mean
	lbs/A								
B2300	—	—	—	—	1,803	2,529	1,588	1,973	—
Bingo	1,122	1,579	2,152	1,618	1,648	2,605	1,769	2,007	1,813
Bounty	—	—	—	—	—	—	2,165	—	—
Celebra	1,166	1,202	2,392	1,587	1,702	2,625	1,548	1,958	1,773
Crusher	1,383	1,705	2,890	1,992	1,446	2,889	1,582	1,972	1,982
Cyclone	—	—	—	—	2,186	2,886	2,406	2,493	—
Delta	—	—	—	—	—	—	1,645	—	—
Donna	—	—	—	—	1,757	2,681	1,628	2,022	—
Global	784	1,385	2,132	1,433	1,701	3,198	2,106	2,335	1,884[1]
Helios	—	—	—	—	1,624	2,994	2,156	2,258	—
Hyola 41	1,448	1,335	2,205	1,633	2,144	2,415	2,219	2,259	1,946
Hyola 401	1,213	1,382	2,330	1,642	2,452	2,809	2,895	2,719	2,181
ICN024	—	—	—	—	2,254	3,068	2,246	2,523	—
Iris	849	1,472	2,244	1,522	1,402	3,122	2,438	2,321	1,922
Legend	1,025	979	1,586	1,196	1,782	2,355	2,123	2,087	1,642
OAC Triumph	778	705	1,496	993	1,103	2,220	1,475	1,599	1,296
Polo	—	—	—	—	1,690	2,746	1,790	2,075	—
S1350	—	—	—	—	1,256	2,803	1,760	1,940	—
ST89/213	—	—	—	—	2,117	2,906	1,862	2,295	—
Stallion	—	—	—	—	1,115	2,242	2,143	1,833	—
SV02413	—	—	—	—	1,845	2,733	2,034	2,204	—
Tobin [2]	631	883	1,205	906	1,746	1,797	2,293	1,945	1,425
Westar	1,127	1,141	1,539	1,269	1,580	2,323	1,809	1,904	1,587[1]
LSD (P 0.05)	293	638	667	559	471	441	396	252	205

[1] Three location average. Long-term average (16 location/years) for Global and Westar are 1703 and 1618, respectively; [2] Tobin is a *Brassica campestris* variety.

Table 20. Characteristics of spring canola *(Brassica napus)* varieties, 1992.

Variety	Crookston Planting to		Roseau Planting to		Lodging[1]	Plant height[1]	Test weight	Oil[1]
	50% bloom	maturity	50% bloom	maturity				
	days		days		(score)[2]	(inches)	(lbs/bu)	(%)[3]
B2300	57	106	55	114	1.9	54	50	37.9
Bingo	63	116	56	124	2.4	56	52	35.8
Bounty	--	--	52	118	--	--	--	---
Celebra	61	115	55	120	2.0	54	49	36.1
Crusher	63	117	56	124	1.3	55	52	36.6
Cyclone	55	109	54	119	4.2	52	51	36.0
Delta	--	--	54	120	--	--	--	---
Donna	63	116	56	123	1.9	56	51	36.4
Global	55	117	56	124	2.7	57	50	35.8
Helios	63	117	56	125	2.4	55	50	36.1
Hyola 40	53	111	51	120	3.3	46	50	35.6
Hyola 41	51	101	50	111	5.8	43	50	34.7
Hyola 401	52	107	51	121	2.8	46	51	34.8
ICN024	50	106	51	120	3.2	46	49	35.8
Iris	63	118	56	124	2.6	57	51	36.6
Legend	54	104	51	119	2.9	48	49	36.1
Polo	54	109	52	117	2.4	45	51	39.7
S1350	65	120	56	125	1.8	56	50	36.5
ST89/213	60	111	55	121	1.9	57	50	36.8
Stallion	62	114	56	122	2.3	52	51	34.6
SV02413	60	117	53	121	2.5	55	49	36.1
Taparoo	54	105	52	119	2.5	50	52	34.1
Tobin[4]	43	94	41	101	1.9	46	52	34.7
Triumph	63	117	56	123	3.2	54	50	34.2
Westar	57	104	55	115	3.6	51	51	36.0
LSD (P 0.05)	2	5	7	13	1.0	2	1	0.9

[1] Average of Crookston, Roseau, and Morris, 1992; [2] 1 = no lodging, 10 = severe lodging; [3] 10% moisture basis; [4] Tobin is a *B. campestris* variety.

SPRING CANOLA VARIETIES

B2300—Variety developed by Alberta Wheat Pool, Box 2700, 505 2nd St. S.W., Calgary, Alberta, Canada T2P 2P5.

Bingo—Developed by ProDana, Denmark. Licensed to Amer-Can Pedigreed Seed Co., Raymond, Ohio 43067. Distributed by local seed dealers or Cenex/Land O'Lakes, P.O. Box 64089, St. Paul, MN 55164.

Bounty—Developed by Svalov-Weibull, Sweden, and Allelix, Inc., 6850 Goreway Dr., Mississauga, Ontario, Canada L0V 1P1. Distributed by Peterson Seeds, Box 346, Savage, MN 55378.

Celebra—Developed by Svalof AB, Sweden. Distributed by Cenex/Land O'Lakes, Box 1291, Minot, North Dakota 58702 and Agri-Tel Grain Ltd., Box 808, Beausejour, Manitoba, Canada R0E 0C0.

Crusher—Developed by Svalof AB Ltd., Sweden. Distributed by Interstate Payco Seed Co., Box 338, W. Fargo, ND 58078.

Cyclone—Developed by ProDana, Denmark. Licensed to Amer-Can Pedigreed Seed Co., Raymond, Ohio 43067. Distributed by local seed dealers or Cenex/Land O'Lakes, P.O. Box 64089, St. Paul, MN 55164.

Delta—Developed by Svalov-Weibull, Sweden, and Allelix, Inc., 6850 Goreway Dr., Mississauga, Ontario, Canada L0V 1P1. Distributed by Northern Sales, 135 Lombard Ave., Winnipeg, Manitoba, Canada R3B 0T4.

Donna—Developed by NPZ, Germany. Licensed to Ameri-Can Pedigreed Seed Co., Raymond, OH 43067. Limited seed available in 1993.

Global—Developed by Svalof AB, Sweden. Distributed by Can Am Seed Co., Box 5236, Grand Forks, North Dakota 58206.

Helios—Marketed by SeedTec International, 12005 N. Burgard Rd., Portland, OR 97283.

Hyola 41—Hybrid developed by Garst Seed Co., Winnipeg, and marketed in U.S. by ICI Seeds Inc., 615 Main St., Coon Rapids, Iowa 50058. Limited seed availability.

Hyola 401—Hybrid developed by Garst Seed Co., Winnipeg, and marketed in U.S. by ICI Seeds, Inc., 615 Main St., Coon Rapids, Iowa 50058.

ICN 024—Hybrid developed by Garst Seed Co., Winnipeg, and marketed in U.S. by ICI Seeds Inc., 615 Main St., Coon Rapids, Iowa 50058. Possible commerical release in 1994.

Iris—Developed by NPZ, Germany. Licensed to Ameri-Can Pedigreed Seed Co., Raymond, OH 43067. Limited seed available in 1993.

Legend—Developed by Svalof AB, Sweden. Distributed by Interstate Payco Seed Co., Box 338, West Fargo, North Dakota 58078.

OAC Triumph—Tolerant of triazine herbicides (Sencor, Lexone, Atrazine, etc). Originated at University of Guelph, Guelph, Ontario, Canada N1G 2W1.

Polo—Developed by Agrigenetics Co., 5649 E. Buckeye Rd., Madison, WI 53716. Distributed by Jacques Seed Co.

S1350—Developed by ProDana, Denmark. Licensed to Ameri-Can Pedigreed Seeds, Inc., Raymond, OH 43067. Possible release in 1994.

Stallion—Tolerant of triazine herbicides (Sencor, Lexone, Atrazine, etc.). Product of Svalof AB, Sweden. Distributed by Agri-Tel

Grain Ltd., Box 808, Beausejour, Manitoba, Canada R0E 0C0.

ST89/213—Marketed by SeedTec International, 12005 N. Burgard Rd., Portland, OR 97283.

SV 02413—Developed by Svalof AB, Sweden. Distributed by Bonis and Co. Ltd., P.O. Box 217, Lindsay, Ontario, Canada K9V 4Z4. Limited seed availability.

Tobin—*Brassica campestris* variety originated by Agriculture Canada, Saskatoon S7N 0X2. Licensed in 1981. Distributed by Northern Sales, 135 Lombard Ave., Winnipeg, Manitoba, Canada R3B 0T4.

Westar—Originated by Agriculture Canada, Saskatoon S7N 0X2. Licensed in 1982. Distributed by Northern Sales, 135 Lombard Ave., Winnipeg, Manitoba, Canada R3B 0T4.

SOYBEAN

Many soybean varieties are available in Minnesota, developed by public and/or private organizations. Important characteristics of these soybean varieties are presented in this section's tables.

Tables 22 to 25 deal with varieties which have been developed by publicly supported institutions and are being considered for recommendation by Minnesota Agricultural Experiment Station. Tables 26 to 29 show performance characteristics of privately developed varieties as well as several public varieties.

Table 21. Genes for resistance to races of Phytophthora root rot.

Gene	*Races*																								
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*
Rps1																									
Rps1-b																									
Rps1-c																									
Rps1-k																									
Rps3																									
Rps4																									
Rps6																									

Performance trials were conducted at various locations in the northern, central and southern zones (see Soybean Maturity Zone map). Specific test locations for each zone are indicated in each table. Becker was the only irrigated test location. Trials were planted between May 1 and May 25 unless otherwise indicated. Row spacings vary in some tables. The plots at the Fairmont location had low levels of Soybean Cyst Nematode for the first time this year.

There are several major factors to be considered in selecting varieties. These include maturity, yield, row spacing, plant height and lodging; chlorosis response; protein and oil values; and phytophthora gene, soybean cyst nematode and brown stem rot resistance.

Maturity—Soybeans are sensitive to day length, so date of maturity is affected by production zone latitude. Because of this, each soybean variety has a narrow range of adaptation. Varieties that mature before the fall killing frost should be selected to obtain high yield and quality. A soybean variety is considered mature when 95 percent of the pods have reached their mature color. Harvesting would normally be done one to two weeks after this stage is reached, depending on drying conditions.

The 1992 growing season was the second coolest on record, consequently the maturity dates listed are later than those reported in earlier editions for several varieties. The accompanying Soybean Maturity Zone map shows recommended varieties for each zone.

Yield—Varieties are arranged in the tables in order of increasing maturity. Later maturing varieties are normally expected to have higher yield potential than earlier maturing varieties.

Compare yields, by looking within a maturity range of about 5 days. Yield comparisons are more reliable if data has been available for several years. Data from different tables should not be compared. All yield data reported in these tables are of replicated tests harvested with a plot combine.

The LSD figures listed at the bottom of table yield columns are measures of variability within the trials. If the yield difference between two varieties within a column exceeds this LSD value it can assumed that the higher yielding variety was truly superior. A 20 percent level of significance is used in the tables. This means that 80 percent of the time yield differences exceeding the LSD value are real differences, the remaining 20 percent of the time the differences are due to chance.

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

Plant Height and Lodging—These measurements indicate stem strength and standability of varieties. They relate somewhat to ease of combining. Actual height and lodging scores are influenced by environmental conditions, so values may vary from year to year. Use these values by comparing scores of newer varieties to scores of a familiar variety.

Chlorosis—This score is a measure of how much leaf yellowing occurred in variety tests conducted each year on a high lime (high pH) soil near Lamberton. It indicates how well varieties perform relative to each other on such soils. These scores are annual ratings and can change from year to year due to environmental conditions.

Phytophthora—Phytophthora root rot can cause significant yield losses when

susceptible varieties are planted in poorly drained fields. There are several races of this fungus, and it is important to know which are present in a field. Several genes can be incorporated into varieties to provide complete resistance to specific races (table 21).

Some information refers to "tolerance" or "field resistance" which is not race-specific and should not be confused with race specific resistance. Reliable tests for tolerance have not yet been developed.

The genes for resistance noted as present in any variety were determined based on data from greenhouse plants grown by scientists in the University of Minnesota Department of Plant Pathology, and on information supplied by the companies.

Soybean Cyst Nematode (SCN)—SCN was first identified in Minnesota in 1978. Areas infested and numbers of nematodes both appear to be increasing. Cooperative Pest Survey Program data now shows this nematode to occur in 30 Minnesota counties, an increase of four counties compared to a year ago.

When SCN numbers are high, significant yield losses can occur. Several races of SCN are known to occur in Minnesota soils. Rotations to non-host crops and planting resistant soybean varieties assist in managing nematode populations.

Results of a special performance test of public and private varieties resistent to soybean cyst nematode are provided in table 28. These trials were conducted on infested sites near East Chain, Hanska and New Richland, where SCN was present at moderate levels, and on non-infested sites at Fairmont, Lamberton and Waseca. Soybean cyst nematode was, however, also noted at low levels in the plots at Fairmont.

Additional details on the soybean cyst nematode and management of infested fields can be found in the publication *The Soybean Cyst Nematode* (AG-FO-3935), 1990, Minnesota Extension Service, University of Minnesota. It is available from County Extension offices or the Distribution Center, 3 Coffey Hall, 1420 Eckles Ave., University of Minnesota, St. Paul, MN 55108.

Brown Stem Rot—Brown stem rot is a fungal disease that can cause yield losses in certain situations. The disease occurs most frequently when soybeans follow soybeans but can also occur where soybeans are only planted every other year. Resistant varieties, or longer rotations out of soybeans, assist in the management of this disease. Text descriptions of public varieties provide information about their resistance to this fungus.

Some information refers to "tolerance" or "field resistance" which is not race-specific and should not be confused with race specific resistance. Reliable tests for tolerance have not yet been developed.

Protein and Oil—Protein and oil values were determined using near infrared reflectance analysis. Protein and oil values are expressed on a 13 percent moisture basis. This formula can be used to convert the protein and oil value to another moisture basis:

$$\frac{100 - \text{desired moisture}}{87} \times \begin{matrix}\text{protein or oil}\\ \text{value given}\\ \text{in the table}\end{matrix}$$

Value of a bushel of soybeans, based on oil and protein content, can be calculated by:

$$APV = 60\,[Po\,(X) + \tfrac{Pm}{44}(Y)]$$

Where:

APV = Approximate value of soybeans (per bushel)
Po = soybean oil price (in $ per pound)
Pm = price of 44% meal (in $ per pound)*
X = oil content at 13% moisture (in decimals)
Y = protein content at 13% moisture (in decimals)

And:

$$\frac{\text{* price of meal (\$/ton)}}{2{,}000} = \text{\$/pound}$$

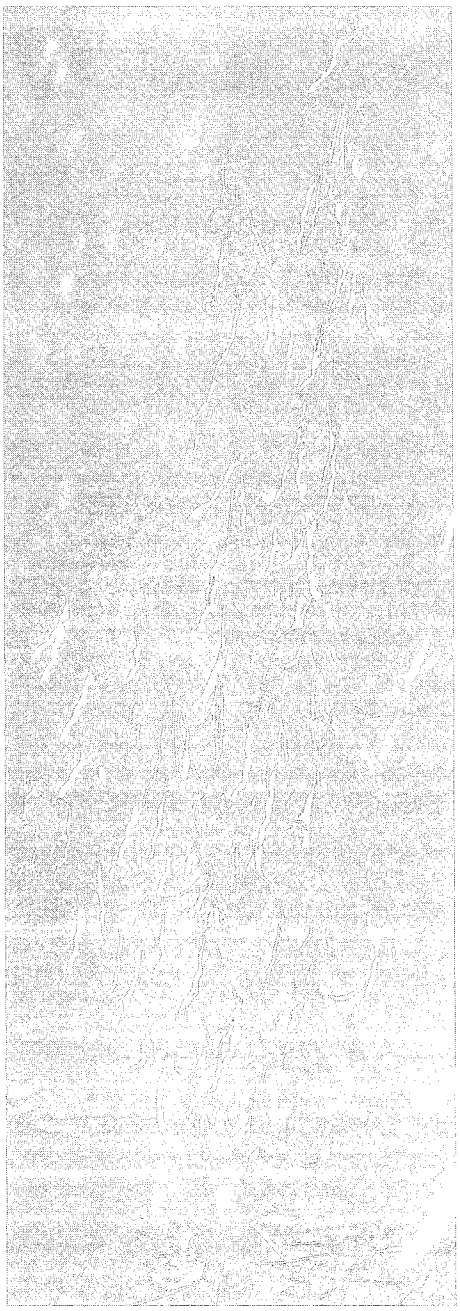
Recommended public varieties

Agassiz—Northern zone. Matures about six days later than McCall. Very good yield potential. Good lodging resistance. *Rps1 gene for resistance to phytophthora.* Developed by Minnesota Agricultural Experiment Station. Released in 1992. Seed sale regulated by U.S. Variety Protection Act.

Alpha—Central and southern zones. One to two days earlier than Parker. Resistant to race 3 and race 14 of soybean cyst nematode. Resistant to brown stem rot. Recommended as part of a management package for producers with a soybean cyst nematode problem. Moderate yield potential. Susceptible to phytophthora root rot. Developed by Minnesota Agricultural Experiment Station. Released in 1992. Seed sale regulated by U.S. Variety Protection Act.

Archer—Similar in maturity to BSR 101 and Corsoy 79. Yield, brown stem rot resistance and iron chlorosis resistance similar to BSR 101. *Rsp1k and Rps6 genes for resistance to phytophthora.* Released 1989 by Iowa Agricultural Experiment Station. Seed Sale regulated by U.S. Variety Protection Act.

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



High yield, full season soybean plant; Parker and Sturdy are two commonly grown varieties of this type.

Bell—Southern zone. Several days later than Hardin in maturity. Resistant to race 3 and race 14 of the Soybean Cyst Nematode. Recommended as part of a management package for producers with a soybean cyst nematode problem. Fair yield potential. Susceptible to phytophthora. Released by Illinois Agricultural Experiment Station 1989. Seed sale regulated by U.S. Variety Protection Act.

Bert—Southern zone. Maturity similar to Hardin. High yielding with taller than average plant height. *Rps1 gene for resistance to phytophthora.* Developed by Minnesota Agricultural Experiment Station. Released 1991. Seed sale regulated by U.S. Variety Protection Act.

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

Dassel—Central zone. Yield similar to Evans. Good lodging resistance. *Rps6 gene for resistance to phytophthora.* Highly susceptible to the herbicide metribuzin. Developed by Minnesota Agricultural Experiment Station. Released 1986. Seed sale regulated by U.S. Variety Protection Act.

Dawson—Central zone. Very good tolerance to iron chlorosis on high lime soils. Higher yielding than Swift. Good lodging resistance. *Rps1 gene for resistance to phytophthora but quite susceptible to race 3 of phytophthora.* Developed by Minnesota Agricultural Experiment Station. Released 1983. Seed sale regulated by U.S. Variety Protection Act.

Evans—Central zone. *Rps1 gene for resistance to phytophthora.* A good variety for late season plantings in the southern zone. Developed by Minnesota Agricultural Experiment Station. Released 1974. Seed sale regulated by U.S. Variety Protection Act.

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

Hardin—Southern zone. Earlier than Corsoy 79. Good yield performance. *Rps1 gene for resistance to phytophthora.* Developed by Iowa Agricultural Experiment Station. Released 1980. Seed sale regulated by U.S. Variety Protection Act.

Hodgson 78—Central and southern zones. Similar to Hodgson, except *Rps1 gene for resistance to phytophthora.* Developed by Minnesota Agricultural Experiment Station. Released 1978. Seed sale regulated by U.S. Variety Protection Act.

Table 22. Yields of publicly developed soybean varieties in northern zone, 1988–92.

Variety	Crookston	Grand Rapids	Moorhead[1]	Roseau	Shelly[1]
	bu/A				
McCall	26	24	32	36	22
Agassiz[2]	30	30	33	38	26
Maple Glen	24	27	32	40	23
Ozzie	27	—	32	—	25
Maple Donovan	30	—	33	—	28
Proto	—	—	28	—	21
Glenwood	—	—	32	—	27
Evans	26	—	31	—	24
Dawson	28	—	35	—	28
Simpson	—	—	31	—	27
Dassel	—	—	30	—	24
LSD 20%	2	2	2	2	2

[1] 1989-92; [2] 1990-92 data adjusted to five year average.

Table 23. Yields of publicly developed soybean varieties in central zone, 1988–92.

Variety	Rosemount (10-inch)	Morris (10-inch)	Becker (30-inch)	Average
	bu/A			
McCall	37[1]	29[1]	—	33[1]
Ozzie	39	33	46	39
Evans	39	37	46	40
Dassel	42	38	47	42
Dawson	40	39	47	42
Glenwood	40	39	47	42
Simpson	40	42	47	43
Lambert	45	42	54	47
Sibley	41	44	46	44
Hodgson 78	43	43	52	46
Kato	42	45	50	46
LSD 20%	1	1	2	1

[1] 1988-1991 data; adjusted to five year average.

Kasota—Central and Southern zones. Slightly later than Hodgson 78 in maturity. Very good yield potential. High protein level. Good lodging resistance. *Rps1c gene for resistance to phytophthora.* Developed by Minnesota Agricultural Experiment Station. Released 1990. Seed sale regulated by U.S. Variety Protection Act.

Kato—Central and southern zones. Maturity similar to Sibley. Outstanding protein level. Very good lodging resistance. Good iron chlorosis resistance. *Rps1 gene for resistance to phytophthora.* Developed by Minnesota Agricultural Experiment Station. Released 1989. Seed sale regulated by U.S. Variety Protection Act.

Lambert—Central zone. About one day later than Glenwood. Excellent yield potential. Good lodging resistance. *Rps1 gene for resistance to phytophthora.* Developed by Minnesota Agricultural Experiment Station. Released in 1992. Seed sale regulated by U.S. Variety Protection Act.

Leslie—Southern zone. Matures about the same as Hardin. High yield potential. Good lodging resistance. *Rps1 gene for resistance to phytophthora.* Developed by Minnesota Agricultural Experiment Station. Released 1991. Seed sales regulated by U.S. Variety Protection Act.

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

Ozzie—Northern and central zones. High yield. Good lodging resistance for its

maturity. *Rps1 gene for resistance to Phytophthora.* Developed by Minnesota Agricultural Experiment Station. Released 1983. Seed sale regulated by U.S. Variety Protection Act.

Parker—Southern zone. About two days earlier than Hardin. Excellent yield potential. Lodging resistance similar to Corsoy 79. *Rps1 gene for phytophthora resistance.* Developed by Minnesota Agricultural Experiment Station. Released in 1992. Seed sale regulated by U.S. Variety Proection Act.

Sturdy—Southern zone. Matures later than Hardin but earlier than Corsoy 79. High yield potential. Good lodging resistance and iron chlorosis resistance. *Rsp1 gene for resistance to phytophthora.* Developed by Minnesota Agricultural Experiment Station. Released 1989. Seed sale regulated by U.S. Variety Protection Act.

Public varieties not adequately tested

Hardin 91—Slightly later in maturity than Hardin. Similar in other respects to Hardin except it has the *Rps1k gene for resistance to phytophthora.* Developed by Iowa Agricultural Experiment Station. Released 1991. Seed sale regulated by U.S. Variety Protection Act.

IA2008—Similar in maturity to Corsoy 79. High yield potential. *Rps1 gene for resistance to phytophthora.* Released 1991. Developed by Iowa Agricultural Experiment Station. Seed sale regulated by U.S. Variety Protection Act.

Other public varieties

Hodgson—Largely superseded by phytophthora-resistant Hodgson 78. Developed by Minnesota Agricultural Experiment Station. Released 1974. Seed sale regulated by U.S. Variety Protection Act.

Maple Glen—Northern zone. Matures about six days later than McCall but earlier than Ozzie. Very good yield potential. Susceptible to phytophthora. Developed by Agriculture Canada, Ottawa. Licensed 1987.

Maple Donovan—Central zone. Slightly later than Evans in maturity. *Rps1 and Rps4 genes for resistance to phytophthora.* Developed by Agriculture Canada, Ottawa. Licensed 1986.

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

Swift—Very good tolerance to iron

Table 24. Yields of publicly developed soybean varieties in southern zone, 1988–92

Variety	Waseca and Lamberton Mid-May Planting	Waseca and Lamberton Mid-June Planting	Fairmont Mid-May Planting 30-inch	Waseca Mid-May Planting 10-inch	Lamberton Mid-May Planting 10-inch	Average Mid-May Planting
	bu/A					
McCall	—	28	—	—	—	—
Ozzie	40	35	32	38	42	37
Proto[1]	39	—	32	38	40	37
Dawson	46	37	36	45	46	42
Evans	43	37	33	40	45	39
Glenwood	44	37	37	42	44	41
Lambert	50[1]	—	39	50[1]	50[1]	49[1]
Dassel	48	38	36	49	48	44
Kato	49	40[1]	44	52	45	47
Hodgson 78	48	37	40	50	46	45
Bert	54	41[1]	44	55	52	50
Sibley	49	—	42	49	49	47
Hardin	53	40	41	55	50	49
Alpha[1]	46	—	40	48	43	44
Parker	56[1]	43[2]	47	58[1]	55[1]	53[1]
Kasota	49	38	43	53	46	47
Weber 84	52	40	42	54	50	49
Leslie[1]	54	40[1]	43	56	51	50
BSR 101	51	38	43	55	47	48
Corsoy 79	53	35	42	55	52	50
Sturdy	54	38	47	56	53	52
LSD 20%	2	2	2	2	3	1

[1] 1989-92 data; adjusted to five year average; [2] 1990-92 data; adjusted to five year average.

Table 25. Characteristics of publicly developed soybean varieties, 1992.

Variety	Mature mid-May Planting	Mature mid-June Planting	Lodging	Height	Phytophthora gene	Protein	Oil	Chlorosis
	date		score[1]	inches		%[2]	%[2]	score[1]
Northern Zone (Crookston and Moorhead)								
McCall	9-13	—	1.0	26	S	35.8	18.2	2.5
Maple Donovan	9-14	—	1.0	27	Rps1 +4	34.6	19.0	3.0
Maple Glen	9-16	—	1.0	25	S	35.3	18.5	4.0
Agassiz	9-16	—	1.0	27	Rps1	34.8	18.8	3.0
Maple Arrow	9-17	—	1.0	24	Rps6	34.6	19.0	2.5
Ozzie	9-20	—	1.0	26	Rps1	35.8	18.2	2.5
Proto	9-20	—	1.5	23	S	37.2	17.1	2.5
Chico	9-22	—	1.0	25	Rps1	34.3	19.0	3.3
Glenwood	9-23	—	2.0	27	Rps1	35.5	18.3	3.5
Evans	9-24	—	1.0	25	Rps1	32.2	20.5	3.3
Dawson	9-25	—	2.3	28	Rps1	33.5	19.7	2.0
Lambert	9-25	—	1.5	28	Rps1	34.3	19.1	3.0
Dassel	9-26	—	1.0	23	Rps6	34.5	19.1	3.0
Minnato	9-30	—	1.8	24	Rps1	35.1	18.5	2.5
Central Zone (Morris and Rosemount)								
McCall	9-17	—	1.5	29	S	35.9	18.1	2.5
Agassiz	9-19	—	1.0	31	Rps1	37.2	17.2	3.0
Chico	9-20	—	2.0	30	Rps1	35.3	17.7	3.3
Ozzie	9-21	—	1.0	30	Rps1	37.5	17.0	2.5
Lambert	9-24	—	1.5	32	Rps1	37.1	17.3	3.0
Dawson	9-24	—	2.0	34	Rps1	36.0	17.9	2.0
Glenwood	9-25	—	1.5	30	Rps1	37.7	16.8	3.5

chlorosis on high lime soils. Susceptible to phytophthora. Developed by Minnesota Agricultural Experiment Station. Released 1972.

Weber 84—Southern zone. Similar to Hardin in maturity. Good tolerance to high lime soils. *Rps1 gene for resistance to phytophthora.* Lodging similar to Corsoy 79. Developed by Iowa Agricultural Experiment Station. Released 1984.

Special purpose public varieties

Chico—Small-seeded variety for specialty markets. Matures slightly earlier than Clay. Seed weight is about 5 grams per 100 seeds less than Clay. Yields less than Clay. *Rps1 gene for resistance to phytophthora.* Developed by Minnesota Agricultural Experiment Station. Released 1983.

Table 25 (continued). Characteristics of publicly developed soybean varieties, 1992.

Variety	Mature: mid-May Planting	Mature: mid-June Planting	Lodging	Height	Phytophthora	Protein	Oil	Chlorosis
	date		score[1]	inches	gene	%[2]	%[2]	score[1]
Evans	9-26	—	2.3	38	Rps1	36.6	17.5	3.3
Simpson	9-26	—	1.5	34	Rps1	36.3	17.8	2.8
Proto	9-26	—	1.5	30	S	40.1	15.3	2.5
Dassel	9-28	—	1.8	32	Rsp6	37.4	17.0	3.0
Hodgson 78	9-30	—	2.3	39	Rps1	35.1	18.5	3.3
Sibley	10-1	—	2.5	37	Rps1	35.2	18.3	3.0
Minnatto	10-1	—	2.0	33	Rps1	38.6	16.2	2.5
Kato	10-1	—	2.0	39	Rps1	38.5	16.4	2.5
Bert	10-1	—	2.8	42	Rps1	35.3	18.4	3.5
Hardin	10-1	—	2.0	39	Rps1	36.3	17.6	4.0
Leslie	10-2	—	2.0	37	Rps1	35.0	18.7	3.5
Kasota	10-3	—	1.8	32	Rps1-c	37.2	17.3	2.8
Parker	10-3	—	3.3	43	Rps1	35.1	18.5	3.0
Corsoy 79	10-4	—	2.5	40	Rps1-c	36.6	17.5	3.3
Sturdy	10-6	—	2.8	39	Rps1	36.6	17.3	2.8
Southern Zone (Lamberton and Waseca)								
McCall	9-9	10-3	2.0	29	S	34.9	18.6	2.5
Agassiz	9-10	9-29	1.5	30	Rps1	36.4	17.8	3.0
Ozzie	9-11	10-7[3]	1.5	32	Rps1	37.3	17.0	2.8
Proto	9-13	—	2.8	28	S	41.6	14.2	2.5
Dawson	9-15	10-8[3]	3.3	35	Rps1	36.2	17.7	2.0
Evans	9-15	10-8[3]	3.3	35	Rps1	36.2	17.9	3.3
Glenwood	9-15	10-10[3]	3.0	30	Rps1	38.4	16.3	3.5
Lambert	9-16	10-10[3]	3.0	32	Rps1	37.8	16.7	3.0
Dassel	9-16	10-10[3]	1.8	32	Rps6	38.6	16.1	3.0
Simpson	9-17	—	2.8	35	Rps1	35.8	17.9	2.8
Kato	9-23	10-15[3]	2.5	39	Rps1	39.2	15.9	2.5
Hodgson 78	9-23	10-15[3]	3.0	41	Rps1	36.3	17.6	3.3
Bert	9-24	10-14[3]	3.5	44	Rps1	35.3	18.3	3.5
Sibley	9-25	—	3.3	38	Rps1	37.0	17.2	3.0
Hardin	9-25	10-20[3]	3.0	40	Rps1	37.3	16.8	4.0
Alpha	9-25	10-15[3]	3.8	42	S	37.6	16.7	2.8
Parker	9-26	10-15[3]	3.8	41	Rps1	36.6	17.4	3.0
Kasota	9-26	10-17[3]	2.5	37	Rps1-c	39.4	15.6	2.8
Weber 84	9-26	10-16[3]	4.0	44	Rps1	36.5	17.5	2.0
Archer	9-27	10-20[3]	3.0	39	Rps1k + 6	35.5	18.0	3.0
BSR 101	9-27	10-20[3]	2.8	41	Rps1	34.6	18.6	2.5
Leslie	9-27	10-19[3]	2.5	41	Rps1	35.7	18.0	3.5
IA2008	9-28	10-20[3]	3.3	41	Rps1	35.3	18.4	3.0
Corsoy 79	9-28	10-20[3]	3.0	43	Rps1-c	37.1	17.2	3.3
Hardin 91	9-28	10-20[3]	2.3	39	Rps1k	38.3	16.2	4.0
Sturdy	9-29	10-20[3]	3.0	42	Rps1	37.0	17.2	2.8
Kenwood	9-29	10-20[3]	3.0	42	S	36.1	17.8	4.0
Bell	9-30	—	4.0	38	S	37.1	17.2	3.5

[1] 1 = excellent, 5 = very poor; [2] 13% moisture; [3] Not mature at frost; estimated maturity date.

Grande—Relatively large seeded variety for specialty markets. Three to four days later than Evans. Seed weight about 6 grams per 100 seeds greater than Evans. Yields less than Evans. Developed by Minnesota Agricultural Experiment Station. Released 1976.

Minnatto—Small-seeded variety for specialty markets. Matures slightly later than Evans. Seed weight about 4 grams per 100 seeds less than Chico. Similar in yield to Chico. *Rps1 gene for phytophthora resistance.* Developed by Minnesota Agricultural Experiment Station. Released 1989. Seed sale regulated by U.S. Variety Protection Act. (Contact Sigco Sun Products, Inc., Breckenridge, MN, for information).

Proto—Very high protein variety for specialty markets. Matures similar to Evans. Protein 3 to 5 percent higher than other varieties. Yields less than Evans. Susceptible to phytophthora. Developed by Minnesota Agricultural Experiment Station. Released 1989.

Vinton 81—Large seeded special purpose variety. Maturity similar to Hardin. Seed weight 6 to 8 grams per 100 seeds greater than Hardin. *Rps1 gene for resistance to phytophthora.* Developed by Iowa Agricultural Experiment Station. Released 1981.

Privately developed varieties

Private companies entering varieties in the 1992 Minnesota tests, and brand names:

AgriPro Seeds, Box 250, 824 2nd St., Brookings, SD 57006 (AgriPro);
Asgrow Seed Company, P.O. Box 7570, Des Moines, IA 50322 (Asgrow);
Cenex/Land O'Lakes Seed, 2827 8th Avenue South, Fort Dodge, IA 50501 (C/LOL);
CIBA GEIGY, P.O. Box 18300, Greensboro, NC 27419 (CIBA GEIGY G-Brand);
Dahlco Seeds, Rt. 2, Box 276, Cokato, MN 55321 (Dahlco);
Dahlgren & Company, Inc., 1220 Sunflower Street, PO Box 609, Crookston, MN 56716 (Dahlgren);
Dairyland Seed Co., Inc., P.O. Box 958, 3570 Hwy. H., West Bend, WI 53095 (DSR);
Dammann Seed Farms, 3374 80th St., Plato, MN 55370 (DSF);
DEKALB Plant Genetics, 3100 Sycamore Road, DeKalb, IL 60115 (DEKALB);
Dennis Ewing Farm Seed, Rt. 4, Ames, IA 50010 (Yield King);
Domestic Seed & Supply, Inc., Box 466, Madison, SD 57042 (Mustang);
Ehrich Seed Farms, RR 1, Elmore, MN 56027 (Ehrich);
ICI Seeds, Rt 2, Box 92A, Carroll, IA 51401 (Diamond), (ICI);
Gold Country Seed, 3374 80th St., Plato, MN 55370 (GCS);
Great Lakes Hybrids, 9915 W. M-21, Ovid, MI 48866 (GL);
Hy-Vigor Seeds, Inc., R.R. 1, Box 77, Paullina,

IA 51046 (Hy-Vigor);
Interstate/Payco, P.O. Box 338, West Fargo, ND 58078-0338 (Payco);
Jacques Seed Company, 720 St. Croix St., Prescott, WI 54021 (Jacques);
J.C. Robinson Seed Co., The, 100 J.C. Robinson Boulevard, P.O. Box A, Waterloo, NE 68069-0301 (Golden Harvest);
Kaltenberg Seed Farms, Inc., 5506 Hwy. 19, P.O. Box 278, Waunakee, WI 53597 (Kaltenberg);
Kruger Seed Company, Box A, Hwy 20 East, Dike, IA 50624 (Kruger);
Latham Brothers Farm, Rt. 1, Alexander, IA 50420 (Latham);
Latham Seed Company, Rt. 1, Box 12, Alexander, IA 50420 (Latham);
Midwest Oilseeds, Inc., 2225 Laredo Trail, Adel, IA 50003 (Midwest Oilseeds);
Northrup King, 7500 Olson Memorial Highway, Golden Valley, MN 55427 (NK);
Pioneer Hi-Bred Int'l, Inc., 130 SE Willmar Ave., Willmar, MN 56201, (Pioneer);
Prairie Brand Seed, Inc., 15 X Ave., Story City, IA 50248 (Prairie Brand);
ProfiSeed, Inc., Route 2, Hampton, IA 50441 (Profiseed);
Ramy International Ltd., 1329 North Riverfront Drive, P.O. Box 3722, Mankato, MN 56001 (Ramy);
Renk Seed Company, 6800 Wilburn Rd., Sun Prairie, WI 53590 (Renk);
Sand Seed Service, Inc., P.O. Box 648, Marcus, IA 51035 (Sands);
Sansgaard Seed Farms, Inc., 15 X Ave., Story City, IA 50248 (Sansgaard);
Sexauer Company, The, P.O. Box 58, Brookings, SD 57006 (SX);
Sigco Research, Box 289, Breckenridge, MN 56520 (Sigco Research);
Star Brand Seed, P.O. Box 648, Marcus, IA 51035 (Star);
Stine Seed Company, 2225 Laredo Trail, Adel, IA 50003 (Stine);
Terra International, Inc., 600 Fourth St., Sioux City, IA 51101 (Terra);
Thompson Agronomics, Inc., Route 1, Box 34, Leland, IA 50453 (Thompson);
Thompson Seeds, Inc., Route 1, Box 34, Leland, IA 50453 (Thompson);
Wilson Seeds, Inc., P.O. Box 391, Harlan, IA 51537 (Wilson);
Ziller Seed Company, Inc., Route 1, Box 122, Bird Island, MN 55310 (Ziller).

Table 26. Yields and characteristics of public and private soybean varieties, northern zone, 1992 (Crookston, Moorhead, Shelly).

Brand or Originator	Variety	Matures	Yield			Phytophthora	Chlorosis	Protein			Oil		
			1990–1992	1991–1992	1992			1990–1992	1991–1992	1992	1990–1992	1991–1992	1992
		date	bu/A			gene[1]	score[2]	%[3]			%[3]		
Agric. Canada	Maple Belle	9-11	27	29	28	Rps1	3.5	34.3	33.4	33.8	18.5	19.3	19.2
Agric. Canada	Maple Ridge	9-11	25	26	26	S	3.0	34.4	33.9	34.6	18.4	18.9	18.7
Minn. A.E.S.	McCall	9-13	31	35	33	S	3.3	33.4	32.5	32.9	18.9	19.7	19.6
GCS	Hunter	9-16	—	37	35	S	3.5	—	33.4	32.9	—	19.1	19.8
Minn. A.E.S.	Agassiz	9-16	34	39	34	Rps1	3.0	35.2	34.4	34.5	17.8	18.5	18.8
Sigco Research	34	9-17	—	36	34	S	2.8	—	33.0	32.7	—	19.3	19.7
NK	X92009	9-18	—	—	38	S	3.8	—	—	32.7	—	—	19.9
Dairyland	DSR-045	9-19	34	38	36	S	3.3	34.1	33.3	33.3	18.5	19.2	19.4
NK	S00-88	9-19	29	33	31	Rps1-c	3.3	33.4	32.7	32.7	19.0	19.6	20.0
Agric. Canada	Maple Donovan	9-20	34	38	37	Rps1 + 4	3.5	33.9	33.1	32.6	18.6	19.3	20.1
Dahlgren	KG 60	9-20	—	37	33	Rps1-c	3.5	—	33.7	33.8	—	19.0	19.2
Agric. Canada	Maple Arrow	9-20	25	29	28	Rps1	3.3	34.3	33.6	33.6	18.3	18.9	19.3
Jacques	J-003	9-21	36	41	38	S	3.5	34.5	34.1	33.9	18.2	18.6	19.0
Agric. Canada	Maple Glen	9-21	29	32	30	S	4.0	34.5	34.2	32.9	18.3	18.6	19.8
Pioneer	9062	9-22	—	—	34	Rps1-c	2.8	—	—	31.9	—	—	20.3
Sigco Research	44	9-22	—	37	33	S	2.8	—	33.5	33.3	—	19.0	19.4
Minn. A.E.S.	Ozzie	9-22	32	36	30	Rps1	3.0	35.4	35.0	34.9	17.6	18.0	18.5
GCS	Tracker	9-23	—	—	36	S	3.0	—	—	32.1	—	—	20.2
Pioneer	9061	9-23	34	37	34	Rps1	3.8	32.5	31.3	30.7	19.6	20.6	21.6
Minn. A.E.S.	Glenwood	9-24	33	38	36	Rps1	3.5	34.5	34.5	34.0	17.9	18.4	19.0
Great Lakes	GL0814	9-24	—	—	36	Rps1	3.5	—	—	32.6	—	—	19.9
DeKalb	CX1076	9-24	—	—	34	S	4.0	—	—	34.4	—	—	18.6
Sexauer	Ex0892	9-24	—	—	34	Rps1	2.8	—	—	31.4	—	—	20.7
CIBA-GEIGY G-Brand	3000	9-24	—	—	32	S	3.4	—	—	32.4	—	—	20.0
Golden Harvest	H-1075	9-24	33	36	32	S	3.5	34.3	33.8	32.4	18.4	19.0	20.0
Minn. A.E.S.	Camden	9-25	—	—	37	Rps1	3.0	—	—	31.7	—	—	20.6
Minn. A.E.S.	Dawson	9-25	33	38	34	Rps1	2.0	33.5	34.5	31.5	19.6	19.6	20.6
Minn. A.E.S.	Evans	9-25	30	32	28	Rps1	3.3	33.7	32.6	31.5	19.9	19.7	20.6
CIBA-GEIGY G-Brand	3072	9-26	—	—	34	Rps1	4.0	—	—	31.9	—	—	19.8
Sexauer	Ex1092	9-26	—	—	34	S	2.0	—	—	32.0	—	—	20.3
Stine	0990	9-27	—	40	37	S	3.5	—	33.4	31.7	—	19.1	20.5
Stine	0950	9-27	—	—	35	S	3.3	—	—	30.9	—	—	20.9
Sexauer	Ex0992	9-27	—	—	33	Rps1	3.3	—	—	32.7	—	—	19.9
Golden Harvest	X-062	9-27	—	—	31	Rps1	3.5	—	—	34.7	—	—	18.5
DeKalb	CX 093	9-27	—	—	29	Rps1	2.5	—	—	30.8	—	—	21.2
Dairyland	DSR-088[4]	9-28	—	—	31	S	2.5	—	—	33.3	—	—	19.6
LSD 20%			1	2	2								

[1] Specific genes noted; S = susceptible; [2] 1 = excellent, 5 = very poor; [3] 13% moisture; [4] Blend (information furnished by originator).

Table 27. Yields and characteristics of public and private soybean varieties, central zone, 1992 (Becker, Morris, Rosemount).

Brand or Originator	Variety	Matures	Yield			Phyto-	Chlorosis	Protein			Oil		
			1990–1992	1991–1992	1992	phthora		1990–1992	1991–1992	1992	1990–1992	1991–1992	1992
		date	bu/A			gene[1]	score[2]	% [3]			% [3]		
Minn. A.E.S.	Ozzie	9-20	41	42	43	Rps1	3.0	36.3	36.1	36.3	17.0	17.4	17.5
Ramy	Roysoy 950	9-21	—	51	45	S	3.5	—	35.4	35.7	—	17.8	17.9
Pioneer	9091	9-22	48	51	50	S	2.5	35.8	35.6	35.7	17.3	17.6	18.0
Ziller	BT 1790	9-22	47	49	50	Rps1-c	3.3	35.6	35.5	36.4	17.4	17.6	17.4
Minn. A.E.S.	Lambert	9-22	—	—	50	Rps1	3.0	—	—	37.3	—	—	17.2
CIBA-Geigy G-Brand	3072	9-22	—	—	48	Rps1	4.0	—	—	35.0	—	—	18.4
NK	S07-90	9-22	47	52	48	S	3.3	34.8	34.5	34.7	18.1	18.6	18.8
GCS	Baker	9-22	43	46	42	S	3.3	36.8	36.5	37.4	16.7	17.2	16.8
Minn. A.E.S.	Evans	9-22	43	46	42	Rps1	3.3	35.3	34.8	35.3	17.7	18.1	18.0
Profiseed	0911	9-23	—	—	49	S	3.0	—	—	35.7	—	—	18.0
Minn. A.E.S.	Dawson	9-23	42	46	44	Rps1	2.0	34.9	34.9	35.5	17.9	18.0	18.0
Great Lakes	GLO 814	9-23	—	48	44	Rps1	3.5	—	35.1	35.5	—	17.9	17.9
Stine	0380	9-24	—	—	54	S	3.5	—	—	37.3	—	—	16.8
Ziller	EXP 962	9-24	—	56	52	S	3.3	—	36.5	37.5	—	17.1	16.8
ICI	Ex 21101	9-24	—	—	50	S	3.5	—	—	38.0	—	—	16.3
Minn. A.E.S.	Simpson	9-24	45	49	49	Rps1	3.0	35.2	34.9	34.9	17.7	18.1	18.4
Jacques	J-063	9-24	—	50	47	Rps1	3.0	—	34.9	35.6	—	18.1	18.0
NK	S12-22	9-24	49	52	46	S	2.8	35.0	34.5	34.7	17.9	18.3	18.6
Diamond	SC 134	9-24	47	50	46	S	2.8	35.7	35.3	36.2	17.3	17.8	17.3
Minn. A.E.S.	Dassel	9-24	44	46	44	Rps6	3.0	36.6	36.4	37.6	16.7	17.0	16.5
Profiseed	1422	9-25	—	—	51	S	3.5	—	—	36.1	—	—	17.7
DeKalb	CX 117	9-25	50	53	49	S	3.8	36.2	36.4	38.0	17.2	17.2	16.6
Mustang	M-1040	9-25	—	—	49	Rps1	3.3	—	—	36.1	—	—	17.7
Great Lakes	GL 1213	9-25	—	—	48	S	2.3	—	—	36.5	—	—	17.2
Thompson	T-3140	9-25	—	53	48	Rps1	3.5	—	36.0	36.4	—	17.5	17.5
Sigco Research	74	9-25	—	—	46	S	2.5	—	—	35.2	—	—	18.2
Golden Harvest	X 112	9-25	—	—	46	S	2.5	—	—	36.3	—	—	17.4
Asgrow	A0949	9-25	45	48	44	Rps1-c	3.3	36.0	35.4	36.2	17.3	17.8	17.4
GCS	Roscoe	9-25	—	—	41	Rps1	3.8	—	—	38.1	—	—	16.2
Sexauer	Ex 1492	9-26	—	—	51	S	3.0	—	—	36.1	—	—	17.7
Mustang	M-1050	9-26	—	54	51	Rps1	4.0	—	35.9	35.4	—	17.5	18.0
Thompson	Ex 230	9-26	—	—	49	S	3.3	—	—	35.6	—	—	18.0
Dahlgren	KG 62	9-26	48	51	49	S	4.0	35.3	35.0	35.2	17.6	17.9	18.0
Dairyland	DSR-138	9-26	—	—	46	Rps1-c	3.5	—	—	34.6	—	—	18.6
NK	X 9212	9-26	—	—	45	Rps1-k	3.0	—	—	34.2	—	—	18.7
Payco	PS0010	9-26	—	49	44	Rps1	2.5	—	36.2	36.4	—	17.4	17.7
Sigco Research	80	9-26	46	48	43	Rps1	3.0	36.6	36.2	36.5	17.1	17.6	18.1
Thompson	T-3100	9-26	46	49	43	S	4.3	36.1	35.7	35.8	17.2	17.5	17.8
Renk	RS 1193	9-26	—	—	42	S	4.0	—	—	36.5	—	—	17.4
Pioneer	9111	9-27	48	51	47	S	3.5	36.9	36.6	37.8	16.7	16.9	16.5
Payco	PS9115	9-27	—	52	46	Rps1-k	3.5	—	34.8	35.2	—	18.2	18.1
GCS	Boyd	9-27	—	—	44	S	2.8	—	—	37.0	—	—	17.0
DeKalb	Cx 096	9-27	46	48	43	Rps1	2.5	36.7	36.2	36.8	16.9	17.4	17.3
Mustang	M-1000	9-27	—	47	42	Rps1	2.8	—	36.9	37.7	—	16.9	16.7
Renk	RS0792	9-27	—	47	41	Rps1	3.8	—	37.6	38.3	—	16.2	16.0
Great Lakes	GL 1315	9-28	—	56	54	S	2.8	—	35.0	35.1	—	18.1	18.5
Kruger	K 1313	9-28	—	—	53	S	3.0	—	—	34.7	—	—	18.7
Kaltenberg	KB 151	9-28	—	55	53	S	3.3	—	34.9	35.0	—	18.1	18.4
Stine	1220	9-28	—	54	52	S	3.0	—	35.0	35.1	—	17.9	18.1
Prairie Brand	PB 137	9-28	—	—	52	S	3.0	—	—	35.7	—	—	17.5
Sands	SOI 113	9-28	—	56	52	S	2.8	—	35.0	34.9	—	18.0	18.2
CIBA Geigy G-Brand	1407 Y	9-28	—	—	50	S	3.0	—	—	34.6	—	—	18.7
Dahlco	Kandi	9-28	—	—	49	Rps1-k	3.8	—	—	38.0	—	—	16.4
Kaltenberg	KB 171	9-28	—	54	49	S	3.3	—	34.2	33.6	—	18.5	19.1
Minn. A.E.S.	Bert	9-28	—	51	48	Rps1	3.8	—	34.0	34.3	—	18.7	18.9
Asgrow	A1662	9-28	—	50	46	M [4]	3.3	—	37.2	37.3	—	16.5	16.8
Agri Pro	AP 1890	9-28	—	55	46	Rps1	4.3	—	34.5	35.0	—	18.4	18.4
Thompson	Ex 905	9-28	—	53	46	S	3.0	—	35.8	36.1	—	17.5	17.7
Minn. A.E.S.	Hodgson 78	9-28	46	49	45	Rps1	3.0	35.1	34.7	35.1	17.9	18.3	18.4
Ziller	BT 1422	9-28	47	49	44	S	3.0	36.5	36.3	37.6	17.0	17.3	16.7
DeKalb	Cx 121	9-28	—	—	43	Rps1	3.0	—	—	35.5	—	—	18.2
Minn. A.E.S.	Parker	9-29	—	—	52	Rps1	3.0	—	—	35.6	—	—	18.0

Table 27 (continued). Yields and characteristics of public and private soybean varieties, central zone, 1992 (Becker, Morris, Rosemount).

Brand or Originator	Variety	Matures	Yield 1990–1992	Yield 1991–1992	Yield 1992	Phytophthora gene[1]	Chlorosis score[2]	Protein 1990–1992	Protein 1991–1992	Protein 1992	Oil 1990–1992	Oil 1991–1992	Oil 1992
		date	bu/A					%[3]			%[3]		
Kruger	K 1818	9-29	—	—	50	S	3.5	—	—	33.6	—	—	19.4
Yield King	K-1212	9-29	—	—	49	S	3.8	—	—	37.4	—	—	16.7
Yield King	K-1888	9-29	—	—	49	Rps1	4.3	—	—	35.5	—	—	18.3
Dairyland	DSR-189	9-29	—	—	48	Rps1-c	3.8	—	—	34.6	—	—	18.6
ICI	D 162	9-29	—	51	46	S	3.5	—	36.8	36.3	—	16.8	17.5
Thompson	T-3187[5]	9-29	—	53	46	S	3.3	—	35.3	34.9	—	17.6	18.2
Pioneer	9131	9-29	—	50	43	S	3.0	—	35.8	36.9	—	17.6	17.0
Star	Exp 8598	9-29	—	—	43	Rps1-k	3.0	—	—	38.3	—	—	16.2
Minn. A.E.S.	Sibley	9-29	44	47	43	Rps1	3.5	36.3	35.9	36.1	16.9	17.3	17.4
Thompson	Ex 968	9-29	—	—	39	S	3.0	—	—	36.0	—	—	17.6
Minn. A.E.S.	Kato	9-29	45	46	38	Rps1	2.5	38.6	38.4	38.5	15.6	15.9	16.1
Yield King	K-1515	9-30	—	—	50	S	4.3	—	—	35.2	—	—	18.0
Yield King	K-1414	9-30	—	—	49	S	4.3	—	—	34.2	—	—	19.0
Thompson	Ex 3177[5]	9-30	—	54	48	S	3.8	—	35.0	35.2	—	17.9	18.2
Kruger	K 1808	9-30	—	—	48	S	3.8	—	—	35.3	—	—	17.9
Hy-Vigor	Row-99	9-30	—	—	48	S	3.3	—	—	36.2	—	—	17.6
Agri Pro	AP 1880	9-30	—	—	47	S	3.0	—	—	35.6	—	—	17.8
Agri Pro	AP 1440	9-30	—	—	46	S	3.3	—	—	36.5	—	—	17.4
Dairyland	DSR-173	9-30	—	—	46	S	4.0	—	—	37.4	—	—	16.8
ICI	Ex 21502	9-30	—	—	45	Rps1-k	2.8	—	—	35.4	—	—	17.8
Iowa A.E.S.	Hardin	9-30	—	—	45	Rps1	4.0	—	—	36.6	—	—	17.0
Jacques	J-145	9-30	—	51	44	Rps1	3.3	—	37.4	38.2	—	16.6	16.4
CIBA-Geigy G-Brand	3185	9-30	46	48	43	S	2.8	35.7	35.8	36.0	17.5	17.5	17.7
Minn. A.E.S.	Alpha	9-30	—	—	42	S	2.5	—	—	37.8	—	—	16.6
GCS	Courtland	9-30	47	48	41	S	3.5	36.8	36.5	37.0	16.8	17.2	17.2
Prairie Brand	PB177 Exp	10-1	—	—	51	S	3.3	—	—	38.4	—	—	16.0
DeKalb	Cx 187	10-1	50	54	49	S	3.5	35.1	35.0	35.1	17.8	18.1	18.4
Thompson	Ex 235	10-1	—	—	46	Rps1	3.3	—	—	36.4	—	—	17.9
CIBA-Geigy G-Brand	3172	10-1	—	—	44	S	4.5	—	—	35.8	—	—	17.8
Sexauer	Ex 1292	10-1	—	—	44	Rps1	4.3	—	—	37.7	—	—	16.5
Kaltenberg	KB 162	10-1	—	—	44	S	3.0	—	—	37.5	—	—	16.8
Hy-Vigor	6133-A	10-1	—	—	43	Rps1	2.8	—	—	38.0	—	—	16.4
Kruger	K 1909	10-1	—	—	43	Rps1	4.5	—	—	36.2	—	—	17.7
Minn. A.E.S.	Leslie	10-1	—	51	43	Rps1	3.3	—	35.8	36.0	—	17.5	17.6
Dairyland	DSR-170	10-1	—	50	41	S	3.3	—	34.7	35.0	—	18.2	18.3
Minn. A.E.S.	Kasota	10-1	45	47	40	Rps1-c	2.8	37.9	38.0	38.2	16.0	16.1	16.3
Sexauer	1890	10-2	—	—	46	S	4.0	—	—	34.6	—	—	18.3
DSF	Russell	10-2	—	49	43	S	3.0	—	35.9	36.4	—	17.4	17.3
Golden Harvest	H-1150	10-2	47	49	42	S	3.5	35.5	34.8	34.3	17.6	18.2	18.9
Profiseed	1850	10-2	—	—	40	S	3.3	—	—	37.5	—	—	16.9
Stine	1070	10-3	46	48	39	S	3.0	36.9	36.9	38.0	16.7	16.9	16.4
LSD 20%			1	1	2								

[1] Specific genes noted, S = Susceptible; [2] 1 = excellent, 5 = very poor; [3] 13% moisture; [4] Mixture of Rps1-k and susceptible; [5] Blend (information furnished by originator).

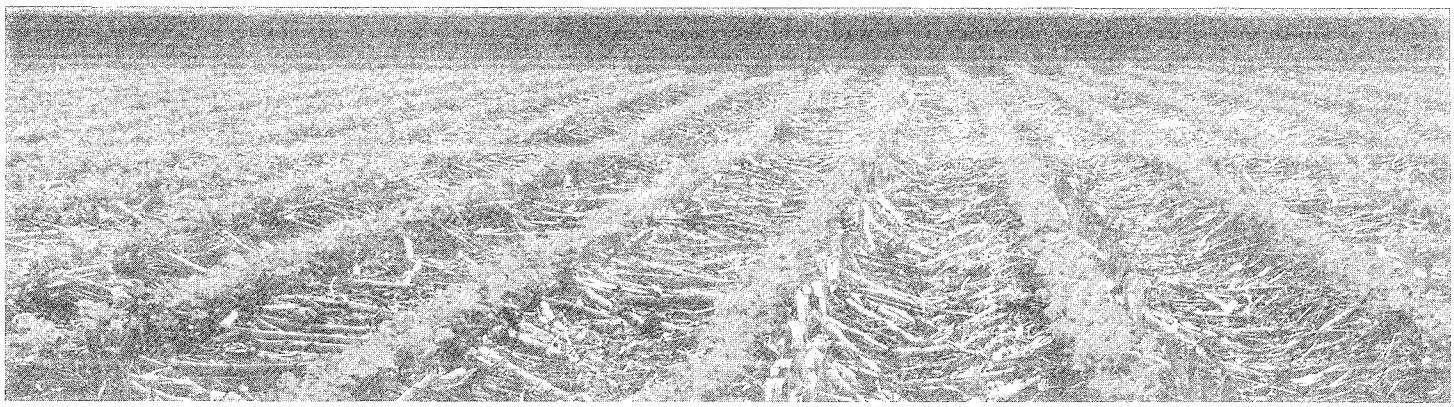


Table 28. Yields and characteristics of public and private soybean varieties from tests on soybean cyst nematode infested (East Chain, New Richland, and Hanska) and non-infested (Fairmont, Lamberton, and Waseca) sites.

Brand or Originator	Variety	Infested Matures	Infested Yield 1991–1992	Infested Yield 1992	Non-infested Matures	Non-infested Yield 1991–1992	Non-infested Yield 1992	Phytophthora gene[1]	Chlorosis score[2]	SCN race(s)[3]	Protein Infested 1991–1992	Protein Infested 1992	Oil Infested 1991–1992	Oil Infested 1992
		date	bu/A	bu/A	date	bu/A	bu/A				% [4]	% [4]	% [4]	% [4]
Thompson	Ex 410CN	9-18	—	42	9-22	—	44	S	3.5	R3	—	35.2	—	18.1
Minn. A.E.S.	Alpha	9-18	35	37	9-24	46	42	S	2.5	R3, 14	37.3	37.4	16.9	16.6
Minn. A.E.S.	Parker	9-19	—	42	9-25	—	53	Rps1	3.0	S	—	36.4	—	17.4
Pioneer	9221	9-20	—	38	9-23	—	41	Rps1	3.5	R3	—	34.6	—	18.4
DeKalb	Ex 218C	9-20	—	36	—	—	—	Rps1	—	R3	—	35.0	—	18.1
Thompson	Ex 425CN	9-21	—	38	9-27	—	43	S	2.8	R3	—	33.8	—	19.0
CIBA-GEIGY	1922Y	9-22	—	40	9-25	—	43	M [5]	2.8	R3	—	40.8	—	14.6
Golden Harvest	X 199	9-22	—	36	9-28	—	44	S	3.0	R3, 14	—	34.5	—	18.5
C/LOL	L1900	9-23	—	37	—	—	—	S	—	R3	—	35.9	—	17.6
Thompson	T-3198 [6]	9-25	38	45	9-28	54	52	S	3.3	M3, 14	36.0	36.0	18.0	17.7
Minn. A.E.S.	Sturdy	9-26	37	41	9-28	53	52	Rps1	2.8	S	36.4	37.0	17.5	17.0
Illinois A.E.S.	Bell	9-27	39	41	9-28	46	44	S	3.3	R3, 14	37.3	37.0	17.1	17.0
Midwest Oilseeds	2352 CN	9-28	—	38	9-30	—	48	S	3.0	R3	—	35.0	—	18.3
DeKalb	Ex 122C	9-28	—	33	—	—	—	S	—	R3	—	35.9	—	17.8
Prairie Brand	PB 215	9-29	—	36	—	—	—	S	—	R3	—	36.5	—	17.4
Iowa A.E.S.	Newton	9-30	—	34	—	—	—	Rps1	3.3	R3	—	34.6	—	19.3
NK	S25-07	10-1	—	37	10-3	—	45	Rps1	2.8	R3, 14	—	36.3	—	17.3
LSD 20%			1	2		2	2							

[1] Specific gene noted, S = susceptible; [2] 1 = excellent, 5 = poor; [3] R = resistant, S = susceptible, M = mixture of resistant and susceptible. Specific races noted. Information in column supplied by originator of variety; [4] 13% moisture; [5] Mixture of Rps1-k and susceptible; [6] Blend (information supplied by originator).

Table 29. Yields and characteristics of public and private soybean varieties, southern zone, 1992 (Fairmont, Lamberton, Waseca).

Brand or Originator	Variety	Matures	Yield 1990–1992	Yield 1991–1992	Yield 1992	Phytophthora gene[1]	Chlorosis score[2]	Protein 1990–1992	Protein 1991–1992	Protein 1992	Oil 1990–1992	Oil 1991–1992	Oil 1992
		date	bu/A	bu/A	bu/A			% [3]	% [3]	% [3]	% [3]	% [3]	% [3]
Renk	RS 1592	9-16	—	46	45	Rps1	3.3	—	35.6	35.2	—	17.8	18.5
Thompson	T-3140	9-18	—	—	43	Rps1	3.5	—	—	34.9	—	—	18.4
Pioneer	9171	9-19	52	49	46	S	4.0	34.5	34.8	35.2	18.2	18.2	18.5
Minn. A.E.S.	Kato	9-19	50	47	45	Rps1	3.0	38.5	39.0	39.1	15.7	15.6	16.0
Minn. A.E.S.	Hodgson 78	9-20	48	46	41	Rps1	3.0	35.3	35.8	35.6	17.6	17.4	17.9
Iowa A.E.S.	Hardin	9-21	53	50	45	Rps1	4.0	36.0	36.0	35.9	17.3	17.4	18.0
Pioneer	9162	9-21	52	48	43	S	3.3	35.3	35.7	36.1	17.8	17.8	17.9
Jacques	J-204	9-22	—	—	49	S	3.3	—	—	35.3	—	—	18.4
Minn. A.E.S.	Bert	9-22	—	48	47	Rps1	3.5	—	34.4	33.8	—	18.3	19.1
Agri Pro	AP 1989	9-22	54	50	46	Rps1-c	3.5	33.5	33.8	33.6	18.9	18.9	19.3
Thompson	Ex 410CN	9-22	—	—	44	S	3.5	—	—	32.7	—	—	19.9
Latham	170	9-22	—	49	43	S	3.3	—	35.9	35.3	—	17.6	18.4
Agri Pro	AP 1890	9-22	—	—	42	S	4.3	—	—	34.9	—	—	18.3
Agri Pro	AP 2040	9-23	54	51	50	S	3.5	35.9	36.1	35.6	17.3	17.3	18.0
Iowa A.E.S.	BSR 101	9-23	55	50	50	Rps1	2.8	34.4	34.3	33.3	18.3	18.5	19.6
Diamond	D200	9-23	55	51	48	S	3.0	35.9	35.9	35.8	17.3	17.5	17.7
Ramy	Roysoy 1525	9-23	—	—	47	Rps1	3.0	—	—	35.3	—	—	18.1
Dairyland	DSR-173	9-23	—	51	46	S	4.0	—	36.5	36.4	—	16.9	17.6
Thompson	Ex 933	9-23	—	—	46	S	3.0	—	—	33.6	—	—	19.4
Jacques	J-181	9-23	54	50	44	S	2.8	34.9	34.9	34.9	17.8	17.9	18.2
Iowa A.E.S.	Weber 84	9-23	51	48	43	Rps1	3.0	35.2	35.2	34.4	17.8	18.0	18.9
Minn. A.E.S.	Kasota	9-23	49	45	42	Rps1-c	2.8	37.4	37.2	36.8	16.5	16.8	17.2
Pioneer	9221	9-23	—	—	41	Rps1	3.5	—	—	31.9	—	—	20.3
Star	Exp 8412	9-24	—	55	52	Rps1	3.5	—	35.7	35.0	—	17.6	18.6
Profiseed	PS 2198	9-24	54	51	51	S	3.8	35.2	35.1	35.1	17.7	17.9	18.4

Table 29. Yields and characteristics of public and private soybean varieties, southern zone, 1992 (Fairmont, Lamberton, Waseca).

Brand or Originator	Variety	Matures	Yield			Phyto-		Protein			Oil		
			1990–1992	1991–1992	1992	phthora	Chlorosis	1990–1992	1991–1992	1992	1990–1992	1991–1992	1992
		date	bu/A			gene[1]	score[2]	%[3]			%[3]		
Dairyland	DSR-189	9-24	—	—	47	Rps1-c	3.8	—	—	35.1	—	—	18.1
Payco	PS 8818	9-24	—	51	47	S	3.3	—	35.4	35.2	—	17.9	18.4
Renk	RS 1493	9-24	—	—	47	Rps1-k	3.5	—	—	37.9	—	—	16.7
Latham	330	9-24	—	52	46	Rps1	3.5	—	35.4	35.0	—	17.8	18.6
Minn. A.E.S.	Sibley	9-24	52	48	45	Rps1	3.5	36.0	36.5	36.2	17.2	17.0	17.4
Minn. A.E.S.	Alpha	9-24	—	46	42	S	2.5	—	36.6	35.7	—	17.0	18.0
Minn. A.E.S.	Parker	9-25	—	—	53	Rps1	3.0	—	—	34.6	—	—	18.4
DeKalb	Cx 187	9-25	—	53	52	S	3.5	—	35.7	35.9	—	17.4	17.7
Asgrow	A2242	9-25	—	—	51	Rps1-k	4.0	—	—	34.7	—	—	18.6
Great Lakes	GL 1917	9-25	—	—	50	Rps1	3.0	—	—	35.5	—	—	18.2
NK	S 19-90	9-25	55	52	50	Rps1-c	3.8	35.4	35.2	34.3	17.5	17.7	18.6
Sexauer	1991	9-25	—	—	49	S	3.3	—	—	35.1	—	—	18.5
Latham	440	9-25	55	52	48	S	3.8	34.9	35.1	35.1	17.9	18.0	18.5
Asgrow	A 1929	9-25	56	52	47	Rps1-k	3.5	35.4	35.7	35.5	17.5	17.5	18.1
Ziller	Exp 903	9-25	—	—	47	S	2.8	—	—	35.6	—	—	18.2
ICI	D 162	9-25	—	—	46	S	3.5	—	—	37.2	—	—	17.1
Mustang	M-1150	9-25	53	49	45	S	3.5	35.5	35.1	35.4	17.8	17.9	18.2
Illinois A.E.S.	Corsoy 79	9-25	54	50	44	Rps1-c	4.0	36.2	36.2	36.5	17.2	17.3	17.7
CIBA-GEIGY G-Brand	1922 Y	9-25	—	—	43	M[4]	2.8	—	—	40.0	—	—	15.5
Great Lakes	GL 1593	9-26	—	—	51	S	3.8	—	—	35.3	—	—	18.3
Latham	200B[5]	9-26	56	52	50	S	3.5	35.1	35.0	34.8	17.7	17.9	18.6
Kruger	K1818	9-26	58	55	50	S	3.5	34.5	34.4	33.4	18.2	18.4	19.3
Stine	2220	9-26	57	53	49	Rps1	3.5	35.2	35.2	34.5	17.7	17.8	18.5
Thompson	Ex 1071	9-26	—	—	49	S	4.0	—	—	33.7	—	—	19.0
Sigco Research	94	9-26	54	50	48	S	3.8	36.9	37.1	36.9	16.8	16.5	17.0
Sexauer	1990	9-26	—	—	48	S	4.0	—	—	35.8	—	—	18.1
Thompson	T-3181	9-26	55	50	47	S	3.3	36.6	36.7	36.5	16.9	17.0	17.5
Diamond	D 150	9-26	—	—	46	S	3.3	—	—	34.6	—	—	18.8
Dairyland	DSR-217	9-26	—	50	46	S	3.8	—	34.9	35.1	—	17.9	18.2
Iowa A.E.S.	Hardin 91	9-26	—	50	46	Rps1-k	4.0	—	36.5	36.7	—	16.9	17.0
Latham	240	9-26	—	50	45	S	4.0	—	34.6	33.5	—	18.2	19.4
Iowa A.E.S.	Archer	9-26	—	47	44	Rps1-k + 6	2.8	—	35.3	35.0	—	17.9	18.6
Proiseed	PS 2350	9-27	—	58	56	S	4.0	—	36.8	36.3	—	16.9	17.8
Kruger	K 2121	9-27	61	57	56	S	3.5	35.8	35.5	35.3	17.3	17.6	18.2
Yield King	D-212[5]	9-27	—	57	54	M[6]	3.8	—	35.4	34.8	—	17.7	18.5
Payco	PS 9023	9-27	—	57	53	S	3.5	—	36.1	35.8	—	17.2	17.7
CIBA-GEIGY G-Brand	3197	9-27	55	54	50	S	3.8	35.7	35.6	35.4	17.5	17.6	18.2
GCS	Dundee	9-27	—	52	50	Rps1-k	3.5	—	36.3	35.8	—	17.2	18.0
Thompson	T-3197[5]	9-27	—	52	50	S	3.3	—	36.5	35.5	—	17.2	18.2
Kaltenberg	KB 192	9-27	—	—	49	Rps1	4.3	—	—	34.4	—	—	18.8
GCS	Hadley	9-27	—	—	48	S	3.8	—	—	35.9	—	—	17.9
C/LOL	L2192	9-27	—	—	48	S	3.0	—	—	36.1	—	—	17.9
Prairie Brand	PB 188	9-27	—	52	48	S	4.0	—	34.0	33.8	—	18.6	19.2
Star	Exp 9218	9-27	—	—	47	S	3.0	—	—	36.1	—	—	17.7
Payco	9218	9-27	—	—	46	S	3.3	—	—	35.2	—	—	18.2
Ehrich	E-274	9-27	—	—	46	S	3.3	—	—	35.7	—	—	18.1
Minn. A.E.S.	Dakota	9-27	—	49	46	Rps1	3.5	—	35.8	34.9	—	17.6	18.4
Prairie Brand	PB 200	9-27	—	—	46	Rps1	4.0	—	—	35.0	—	—	18.3
NK	S 20-20	9-27	53	49	45	Rps1-c	3.0	35.8	35.8	35.9	17.9	17.5	18.0
Remy	RoySoy 2025	9-27	—	46	44	Rps1	3.8	—	35.5	35.4	—	17.6	18.3
Thompson	Ex 425CN	9-27	—	—	43	S	2.8	—	—	32.5	—	—	19.8
Kruger	K2525	9-28	61	57	57	S	3.8	35.8	36.0	36.1	17.4	17.5	17.9
Diamond	SC 232	9-28	—	58	57	S	3.5	—	35.6	35.5	—	17.6	18.2
Midwest Oilseeds	Ex 1590	9-28	—	—	56	S	4.0	—	—	35.5	—	—	18.2
Kaltenberg	KB 171	9-28	—	—	54	S	3.3	—	—	34.3	—	—	18.7
Kaltenberg	KB 220	9-28	60	55	54	S	3.5	36.0	35.9	35.3	17.2	17.3	18.1
Prairie Brand	PB 225	9-28	62	57	54	S	4.0	36.2	36.1	35.9	17.2	17.4	17.9
Sands	SOI 214	9-28	61	57	54	S	3.5	35.8	35.7	35.2	17.3	17.5	18.1
Kruger	Desoy 222+[5]	9-28	59	55	53	S	3.3	35.9	36.2	36.5	17.3	17.3	17.6
Thompson	T-3190	9-28	58	52	53	S	3.8	36.0	35.9	35.5	17.3	17.5	18.1
Ehrich	E-298	9-28	59	55	52	S	4.0	36.1	36.0	35.5	17.3	17.4	18.2
Sansgaard	S 2062	9-28	59	55	52	S	2.5	36.5	36.7	36.5	17.0	17.0	17.6

Table 29. Yields and characteristics of public and private soybean varieties, southern zone, 1992 (Fairmont, Lamberton, Waseca).

Brand or Originator	Variety	Matures	Yield			Phyto-		Protein			Oil		
			1990–1992	1991–1992	1992	phthora	Chlorosis	1990–1992	1991–1992	1992	1990–1992	1991–1992	1992
		date	bu/A			gene[1]	score[2]	%[3]			%[3]		
Minn. A.E.S.	Sturdy	9-28	55	53	52	Rps1	2.8	36.0	36.3	35.4	17.3	17.2	18.3
Thompson	T-3198[5]	9-28	—	54	52	S	3.5	—	36.1	36.0	—	17.3	17.8
Mustang	M-1200	9-28	60	56	51	S	3.5	35.9	35.9	36.0	17.4	17.5	17.9
Asgrow	A2396	9-28	56	51	50	Rps1	3.8	34.7	34.6	34.2	18.1	18.3	19.0
Prairie Brand	PB 187 Exp	9-28	—	—	50	S	3.3	—	—	36.7	—	—	17.2
Profiseed	PS 1807	9-28	—	—	49	S	4.3	—	—	33.4	—	—	19.2
Sansgaard	S2220 Exp	9-28	—	—	49	S	2.8	—	—	35.5	—	—	18.3
Sigco Research	96	9-28	—	51	48	S	3.0	—	35.1	34.7	—	17.9	18.6
Ziller	BT 2585	9-28	54	51	48	S	3.0	36.7	37.0	37.1	16.8	16.7	17.1
Golden Harvest	H-1196	9-28	—	—	48	S	3.8	—	—	35.7	—	—	18.1
Terra	TS 175	9-28	—	—	48	S	2.8	—	—	36.6	—	—	17.3
Star	Exp 9222	9-28	—	—	47	Rps1-k	3.0	—	—	36.9	—	—	17.1
Terra	Runner III	9-28	54	50	47	S	3.5	35.8	35.8	35.4	17.4	17.6	18.3
DeKalb	Cx 210	9-28	54	49	45	S	4.3	34.5	34.5	34.2	18.1	18.3	18.9
Renk	RS 1992	9-28	—	49	45	Rsp1-c	3.3	—	35.7	35.1	—	17.4	18.1
Illinois A.E.S.	Bell	9-28	49	46	44	S	3.3	37.3	37.3	36.3	16.4	16.6	17.6
Golden Harvest	X 199	9-28	—	—	44	S	3.0	—	—	33.1	—	—	19.3
GCS	Russell	9-28	52	47	41	S	3.0	36.6	36.6	36.6	16.9	17.0	17.0
Latham	660	9-29	—	—	54	S	4.3	—	—	35.2	—	—	18.2
Yield King	D-232[5]	9-29	—	—	52	M[6]	3.5	—	—	34.5	—	—	18.6
NK	S 24-92	9-29	—	—	52	S	4.0	—	—	36.1	—	—	18.0
Terra	TS 205	9-29	—	55	52	S	3.0	—	36.1	35.7	—	17.4	18.1
Ziller	BT 2919	9-29	—	54	51	S	3.3	—	36.0	35.7	—	17.3	17.9
Kaltenberg	KB 241	9-29	—	—	51	S	3.8	—	—	35.5	—	—	18.2
DeKalb	Cx 259	9-29	52	48	50	S	4.0	35.3	35.0	34.9	17.9	18.2	18.6
Thompson	Ex 319	9-29	—	—	50	S	3.8	—	—	35.9	—	—	17.9
Stine	1090	9-29	—	54	48	S	3.5	—	34.7	34.0	—	16.3	19.3
Wilson	1993[5]	9-29	—	51	48	S	3.3	—	35.6	34.8	—	17.8	18.5
CIBA-GEIGY G-Brand	3172	9-29	—	—	48	S	4.5	—	—	35.5	—	—	18.1
Dahlgren	D 3223	9-29	57	51	47	S	3.2	36.1	36.1	35.9	17.0	17.1	17.6
Ziller	Exp 933	9-29	—	—	47	S	3.3	—	—	33.2	—	—	19.7
Dahlgren	D 3151	9-29	—	—	46	S	3.0	—	—	37.0	—	—	17.1
Hy-Vigor	187 x R	9-29	—	—	42	Rps1	3.3	—	—	35.7	—	—	18.1
Latham	650	9-29	50	46	42	S	3.3	35.9	36.0	35.4	17.1	17.1	17.8
Sansgaard	S 2120	9-30	—	56	54	S	3.8	—	36.4	35.9	—	17.1	17.9
Sexauer	2390	9-30	—	—	53	S	3.8	—	—	35.4	—	—	18.2
Golden Harvest	X 263	9-30	—	—	51	S	4.0	—	—	34.8	—	—	18.8
Yield King	K-2122	9-30	—	—	50	S	3.3	—	—	35.7	—	—	17.9
Asgrow	A 2234	9-30	54	52	49	Rps1-k	3.3	35.6	35.7	34.8	17.6	17.6	18.5
Yield King	D-233	9-30	—	51	49	Rps1	3.5	—	35.5	34.5	—	17.6	18.6
Jacques	J-251	9-30	—	—	49	S	4.3	—	—	36.0	—	—	18.0
Midwest Oilseeds	2352 CN	9-30	—	—	48	S	3.0	—	—	34.1	—	—	19.2
Ramy	Preferred II	9-30	—	51	48	Rps1-c	4.0	—	37.3	37.0	—	16.5	17.0
Pioneer	9232	9-30	—	—	47	Rps1-c	3.8	—	—	33.4	—	—	19.6
Mustang	M-1180	9-30	—	—	47	S	3.5	—	—	36.1	—	—	17.8
Profiseed	PS 1152	9-30	52	47	46	S	3.0	36.0	35.9	36.1	17.3	17.5	17.7
DeKalb	Cx 264	9-30	53	48	42	S	3.3	35.8	35.8	36.3	17.5	17.5	17.6
Sansgaard	S-2270 Exp	10-1	—	—	54	S	3.3	—	—	36.4	—	—	17.5
Latham	661[5]	10-1	—	—	51	S	4.0	—	—	35.0	—	—	18.2
Stine	2250	10-1	—	—	49	S	4.0	—	—	35.3	—	—	18.0
Pioneer	9231	10-1	—	50	48	Rps1-k	3.8	—	36.5	35.6	—	16.9	17.8
Sands	SOI 117	10-1	56	51	47	S	3.5	34.3	34.2	33.8	18.3	18.6	19.3
Hy-Vigor	Exik-300[5]	10-1	—	—	46	Rps1	3.8	—	—	34.7	—	—	18.6
Thompson	Ex 530	10-2	—	—	49	S	3.8	—	—	33.7	—	—	19.4
CIBA-GEIGY G-Brand	3202	10-2	—	—	44	S	4.0	—	—	35.6	—	—	18.2
NK	S 25-07	10-3	—	—	45	Rps1	2.8	—	—	35.6	—	—	18.2
LSD 20%			1	2	2								

[1] Specific genes noted, S = susceptible; [2] 1 = excellent, 5 = poor, see text for additional explanation; [3] 13% moisture; [4] Mixture for Rps1-k and susceptible; [5] Blend (information furnished by originator); [6] Mixture for Rps1 and susceptible.

CROPS NOT IN CURRENT TRIALS

Crambe and Oilseed Rape

Crambe *(Crambe abyssinica)* and oilseed rape *(Brassica napus* or *B. campestris)* are crops grown for the production of high-erucic acid industrial oil. This oil is used in the production of plastic films, waxes, lubricants, nylons, and in the steel industry. Both crambe and oilseed rape are members of the cruciferae (mustard) family, and are specialty crops best grown under contract.

Canadian plant breeders have developed oilseed rape varieties with oil containing over 40 percent erucic acid. These varieties are grown under contract so that they cannot be marketed as canola. Oilseed rape is occasionally grown under contract in Minnesota.

Crambe varieties were tested in Rosemount, Minnesota, in 1991. It should be noted that yields of cruciferae crops are generally lower at Rosemount than when these crops are planted at more northerly locations. For further information about crambe and oilseed rape, contact your county extension agent or the Center for Alternative Plant and Animal Products, 340 Alderman Hall, Univ. of Minnesota, St. Paul, MN 55108.

Flax

Common flax was one of the crop first crops domesticated, thought to have originated in the Mediterranean region of Europe. In the United States, early colonists grew small fields of flax for home use. Commercial production of fiber flax began in 1753. During the 1940's fiber flax production in the U.S. dropped to nearly zero. Today only a few individuals in North America grow fiber flax for their own use to make linen. The major fiber flax producing countries are the Soviet Union, Poland, and France.

Minnesota had 378,000 acres planted to flax in 1920 and over 16,000,000 acres in 1943. Since 1943, acreage has steadily declined to only 15,000 in 1988. State average yield of 9.5 bushels per acre in 1920, increased to 16 bushels in 1987. Minnesota, flax acreage is concentrated in the northwest, but flax has been grown successfully in nearly all counties.

Minnesota Agriculture Experiment Station scientists are not currently conducting performance trials of flax. If you want information from the most recent report of tests of this crop, contact Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108.

Additional production information is provided in the flax chapter in *Alternative Field Crops Manual.* Contact your county extension agent or The Center for Alternative Plant & Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108, for details about this publication.

Mustard

During the Middle Ages seeds from cultivated mustard *(Brassica spp.)* provided special oils for flavoring European foods. It is still used widely as a source of oil and for table mustard preparations. It is a contract specialty crop grown in rotation with small grains such as wheat, oats and barley.

About 25,000 Minnesota acres were planted to mustard in 1963. Most was grown under contract in the northwest part of the state. Present Minnesota mustard acreage is unknown, but Canada, Denmark and the United Kingdom are now large producers.

Three types of mustards can be grown in Minnesota: yellow, oriental (Brassica hirta) and brown (Brassica juncea). Only the yellow mild table mustard type has high yield in the state. The other types are grown on fewer acres, for specialty hot mustard products.

Minnesota Agriculture Experiment Station scientists are not currently conducting performance trials of mustard. If you want information from a recent report of tests of this crop, contact Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108.

Sunflower

Sunflower originated in North America. Introduced to Europe, it spread as a curiosity until it reached Russia where it was readily adapted. Selection for high oil in Russia began in 1860.

High oil lines after World War II, rekindled interest in the crop. Production rose dramatically in the Great Plains states to meet markets for sunflower oil, birdseed, and human snack foods. Production in the 1980s has declined because of low prices, disease, insect and bird problems. Sunflower acreage is moving west into dryer regions, but 85 percent of the North American sunflower seed is still produced in North and South Dakota and Minnesota.

Minnesota Agriculture Experiment Station scientists are not currently conducting performance trials of sunflower. If you want information from a recent report of tests of this crop, contact Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108.

Additional production information is provided in the sunflower chapter in *Alternative Field Crops Manual.* Contact your county extension agent or The Center for Alternative Plant & Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108, for details about this publication.

PULSE CROPS

CROPS NOT IN CURRENT TRIALS

Adzuki

Adzuki, the sixth largest crop in Japan, is prized for its red color, delicate flavor and the characteristic grainy texture of the pastes made from it. It has been produced in Minnesota in recent years under contract for export to Japan and for use in special ethnic or health food products in the U.S.

Minnesota Agriculture Experiment Station scientists are not currently conducting performance trials of adzuki. If you want information from a recent report of tests of this crop, contact Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108.

Production information for adzuki is provided in the *Alternative Field Crops Manual.* Contact your county extension agent or The Center for Alternative Plant & Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108, for details about this publication.

Fieldbean

In tons of crop produced per year, the fieldbean is the world's third most important legume. Acreage in the U.S. is concentrated in Michigan, North Dakota, Minnesota, Idaho, Colorado, Nebraska. Grower interest is largely determined by two factors: prices and proximity of buying stations or processors.

Minnesota Agriculture Experiment Station scientists are not currently conducting performance trials of fieldbean. If you want information from a recent report of tests of this crop, contact Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108.

Production information is provided in the fieldbean chapter in *Alternative Field Crops Manual.* Contact your county extension agent or The Center for Alternative Plant & Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108, for details about this publication.

Fieldpea

Fieldpea *(Pisum sativum)* is usually combine harvested as mature, dry seed, for use in soup and pigeon or farm feed. When used for a forage or feed grain crop, fieldpea is often sown in mixture with oat.

Varieties with cream-colored seed are most common. Buyers in Minnesota have not encouraged production of green varieties.

Miranda and Trapper produce seed of satisfactory cooking quality. Other varieties have not been tested for culinary quality, but they may be used as a protein concentrate feed for livestock. Trapper and Procon are also useful as forage crops, grown alone or in mixture with small grains.

Stand establishment can be a problem due to susceptibility of plants to seedling diseases, and to variability in seed quality.

Fieldpeas were not tested in 1991. For recent data on fieldpea varieties, write Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108. Information is also provided in the *Alternative Field Crops Manual.* Contact your county extension agent or the Center for Alternative Plant and Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108.

Lentil

Lentil, has received little research attention to improve yield or quality. It grows well in limited rainfall areas. Lentil protein content ranges from 22 to 35 percent. It supplements cereal grain diets, or can be used as a green manure crop.

Minnesota Agriculture Experiment Station scientists are not currently conducting performance trials of lentil. Information is available from a recent report of tests of this crop. Contact Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108.

Production information is provided in the *Alternative Field Crops Manual.* Contact your county extension agent or The Center for Alternative Plant & Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108.

Lupin

Lupinus albus L. is a cool season grain legume suited to well drained, coarsely textured, neutral to acidic soils. They tolerate early season frosts, but high temperatures cause flower blasting and reduce seed yields. Llupin is well adapted in the central and northern portions of Minnesota on sandy, acidic soils. Crop failures or low yields have occurred at Waseca, Lamberton, Crookston and St. Paul on heavier, alkaline soils.

Lupin uses include direct feeding to poultry and livestock, as well as markets for human consumption products. Lupin has been used successfully direct-fed in dairy rations. In Minnesota lupins are processed into flour, pasta and hulls for dietary fiber. Lupins should not be produced until potential markets or uses are first identified.

Potential seed sources include Wolf River Valley Seeds, N2976 County M, White Lake, WI 54491; and Lupin-Triticale Enterprises, P.O. Box 187, Perham, MN 56573.

Minnesota Agricultural Experiment Station scientists are not currently conducting performance trials on lupin. Research data from 1988-1990 is available from Extension Agronomy, 411 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN 55108.

Production information is provided in the *Alternative Field Crops Manual.* Contact your county extension agent or the Center for Alternative Plant and Animal Products, 340 Alderman Hall, University of Minnesota, St. Paul, MN 55108 for this publication. A detailed "Lupin Production and Utilization Guide" is available from the Center for $10.

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)	Planting Date
Barley	48	14,300	85	28/sqare foot	Early spring
Corn	56	1,400	17	24,000/acre	Late April or early May
Fieldbean Black turtle soup	60	2,300	45	105,000/acre	May 20 to June 15
Great northern		1,000	100	90,000/acre	
Kidney		900	90–115	90,000/acre	
Navy		2,500	42	105,000/acre	
Navy 6– to 14–inch rows			60	150,000/acre	
Pink		1,700	60	105,000/acre	
Pinto		1,300	80	90,000/acre	
Small Red		1,400	75	100,000/acre	
Small White		3,000	35	105,000/acre	
Flax	56	88,000	42	85/square foot	April 15 to May 15
Forage Grasses (perennial)	If mixed with legume, sow at time indicated for the legume				
Bromegrass alone	14	136,000	16	50/square foot	Early spring or summer
in mixtures			10	31/square foot	
Orchardgrass in mixtures	14	653,000	2	30/square foot	Early spring or summer
Reed canarygrass alone	46	526,000	7	85/square foot	Early spring or summer
in mixtures			5	60/square foot	
Tall fescue in mixtures	25	229,000	4	21/square foot	Early spring or summer
Timothy in mixtures	45	1,234,000	3	85/square foot	Early spring or summer
Forage Legumes (perennial)					
Alfalfa alone	60	199,000	11	50/square foot	Early spring to August 10
with grass			7	32/square foot	
Alsike clover in mixtures	60	653,000	2	30/square foot	Early spring to August 10
Birdsfoot trefoil alone	60	372,000	7	60/square foot	Early spring or summer
with grass			4	34/square foot	
Ladino clover in mixtures	60	784,000	1	18/square foot	Early spring to August 10
Red clover alone	60	252,000	9	50/square foot	Early spring to August 10
with grass			5	30/square foot	
Oat	32	16,200	80	28/square foot	Early spring
Rye	56	18,200	60	25/square foot	September
Sorghum 18– to 40–inch rows	56	15,000	10	150,000/acre	May 20 to June 5 for grain
6– to 14–inch rows			15	5/square foot	
Soybean 10-inch rows	60	2,800	56	3/foot of row	May 5 to May 25
20–inch rows			56	6/foot of row	
30–inch rows			56	9/foot of row	
40–inch rows			56	12/foot of row	
Sunflower Nonoilseed	24	4,300	4	17,000/acre	May 1 to June 15
Oilseed	27	7,700	3	23,000/acre	
Wheat Durum	60	12,100	90	25/square foot	Early spring
Hard red spring		15,200	80	28/square foot	Early spring
Winter		14,500	75	25/square foot	August 20 to September 20
Other Crops					
Adzuki	60	3,500	40–60	150,00–200,000/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 B napus	50	140,000	8	25/square foot	May
Canola B campestris	50	210,000	5	25/square foot	May
Crambe	22	65,000	15	23/square foot	Late April to early May
Fieldpea	60	2,300	180	9/square foot	Early spring
With 1½ to 2 bushels of oat			70	4/square foot	
Fababean-modium 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	40	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
Tanglerpea	60	4,500	85	9/square foot	Early spring
Wild rice (wei)	25	7,900	33	6/square foot	Late fall

[1] US legal if established. If not established, weight given is that most widely accepted in the United States.