

Minnesota Agricultural Experiment Station

VARIETY TRIALS

OF SELECTED FARM CROPS

CROP DATA REPORTS FOR 1997 PRODUCTION

Usage Notes:

This publication marks a departure from past year's editions. The reports which make up this publication are essentially printed copies of electronic versions prepared for the Minnesota Agricultural Experiment Station's World Wide Web site on the Internet. Only crops for which new data was compiled in the 1996 growing year are included in this edition. Slight modifications have been made to eliminate a duplicative introductory page from each report. As of the date of preparation of this publication, those electronic versions were available via <http://www.mes.umn.edu/~maes/>. Additional electronic reports, of crops last evaluated in a year prior to 1996, are also planned for the WWW site.

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VARIETY TRIALS

1997 Crop Data Reports

Successful crop production depends on selecting the best varieties for a particular farm. The various crop varieties evaluated in these reports are compared in trial plots on different combinations of Minnesota Agricultural Experiment Station fields at Crookston, Grand Rapids, Lamberton, Morris, Rosemount, St. Paul and Waseca, and on farmers' fields across the state (and for alfalfa, several additional University of Wisconsin-Madison sites). These plots are handled so that the environmental factors affecting yield, quality, winter survival, and other characteristics are as nearly as possible the same for all varieties.

Variety Classifications

Many crops have their varieties classed into subgroups under the headings such as "recommended public varieties," "special purpose variety," "other varieties," etc. Variety descriptions are arranged alphabetically or by some important growing characteristic, such as maturity date, within groups.

When noted, classifications of varieties as "recommended," "other," etc., are determined each year by the 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.

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

New varieties from other public experiment stations and private plant breeders, but not sufficiently evaluated by Minnesota's Agricultural Experiment Station scientists, are listed as "varieties not adequately tested." Available information is presented for these varieties, but no conclusions are drawn regarding their suitability for Minnesota conditions.

Seed of varieties in many crops may be eligible for certification, and the use of certified seed is suggested, when available. However, certification does not imply recommendation. Registered and certified seed of varieties described in this report can be purchased from seed dealers or from growers listed in the Minnesota Registered and Certified Seed Directory for 1997 Planting. This annual publication can be obtained without charge from the Minnesota Crop Improvement Association, 1900 Hendon Avenue, St. Paul, MN 55108, or from county extension agents' offices. The information is also available on-line at <<http://www.rtrade.org/mcia/>>.

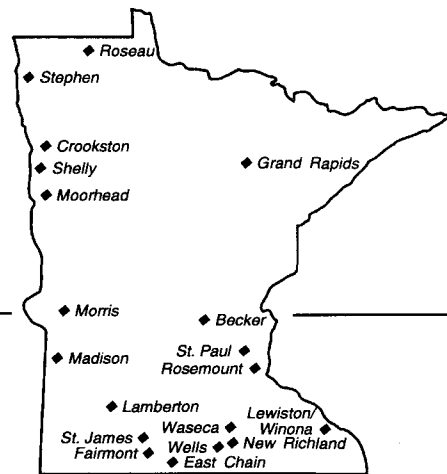
Interpreting the Tables

The LSD (Least Significant Difference) figures are statistical measures of variability within the trials. This statistic is used to determine whether the differences between two varieties in quality, yield or other measured characteristics are due primarily to genetic difference in the varieties.

If reported difference between two varieties equals or exceeds the LSD value listed for a column, you can conclude that the variety with the higher number was superior in that characteristic. If the difference is smaller, greater attention should be given to other traits which are also important in making your variety choices. The notation "NS" in a column indicates no significant difference exists for that characteristic.

The Minnesota Agricultural Experiment Station performance trials are not designed for comparisons between crop species, 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.

The relative maturities of varieties are variously indicated in the tables as date



Locations of variety trials in the reports of this publication.

of or days to maturity, heading, or blooming, moisture percentage at harvest, etc.

Protection Act

Varieties receiving U.S. Plant Variety Protection Act registration beginning in 1995 have been identified by the code "PVP(94)." These varieties may not be sold by a producer, not even to a relative or neighbor, without the express permission of the variety's developer/owner.

Authors/Researchers

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Additional contributions for assorted crop reports, including data summarizations, laboratory work, disease/pathogen information, etc., was variously provided by Ruth Dill-Macky, James Halgerson, Kurt Leonard, Donald McVey, Gerald Ochocki, Duane Schriever, Ward Stienstra, and Nevin Young.

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ALFALFA VARIETY TRIALS

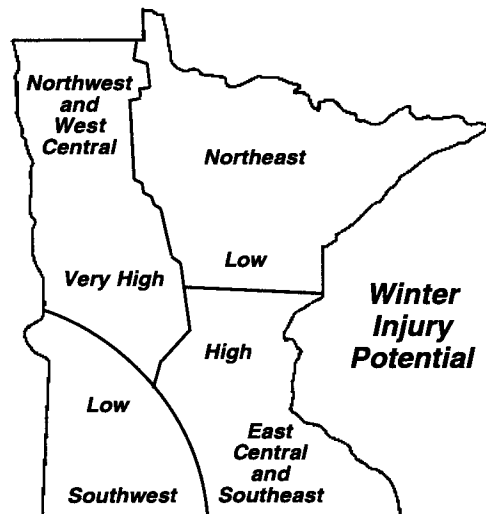
**Minnesota Agricultural Experiment Station — University of Minnesota
Revised January 1997**

Results of Public and Private Alfalfa Tests Conducted by the Minnesota Agricultural Experiment Station. Prepared by Neal P. Martin, extension agronomist-forages, Craig C. Sheaffer, agronomist, Duane A. Schriever, scientist, and Doug Swanson, associate scientist, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108.

Winter hardiness, Winter Survival, and Fall Dormancy

Severe winters make winter hardiness a primary consideration in variety selection for most areas of Minnesota. The 1989–90, 1991–92, and 1994–95 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 subject to winter injury.

The greatest winter hardiness is needed in the west central and northwest Minnesota area. 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 area also experience frequent severe winters. Winter-hardy varieties with high levels of disease resistances should be selected for this area. The southwest area seldom experiences severe winter injury because of dry soils, high soil potassium levels and neutral soil pH. The northeast area 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.



Winter hardiness of varieties is extremely difficult to determine because winter injury can occur as a result of many different weather events and alfalfa plants of differing ages respond differently to various weather events. A new test called "Winter Survival" is used to determine winter hardiness of varieties. This standardized test, North American Alfalfa Conference Win-

ter Survival Test, measures the survival of a variety after a severe winter. Tests are conducted annually at four locations, Arlington and Marshfield, Wisconsin, and Rosemount and Morris, Minnesota, providing a winter survival index (WSI).(Table 3)

The WSI was pooled over all tests (Rosemount trial in 1995 did not meet test criteria due to uncontrolled ice sheeting) to provide an estimate of winter hardiness. This is presented with yield data in Table 2A. Varieties are rated from 'superior' to 'adequate' in winter survivability. Vernal, a traditional winter-hardy variety to which other varieties are often compared, is rated superior. Varieties rated 'adequate' in winter survivability are expected to be injured the most after a severe winter. Varieties not tested for winter survival are listed in Table 2B and ranked alphabetically. If a variety does not have a WSI, the fall dormancy index is the next best indicator of winter hardiness (1 = very winter-hardy; 2 = winter-hardy; 3 or 4 = moderately winter-hardy).

Fall dormancy ratings of varieties are listed alphabetically in Table 1A. Varieties that are very fall dormant 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 10 percent bloom several days earlier than more dormant varieties. The general pattern of production for moderately dormant varieties under a four-harvest management has been to produce high yields during the first year after seeding, good yields for year two—similar to winter-hardy, fall dormant varieties—and reduced yields in years three and four. The reduced yields in years three and four are usually associated with winter injury.

Alfalfa yield of a given variety is predicted best after three test locations have been measured over four years of stand life (three years after seeding). Variety yield performance is not significantly different the first two years after seeding. Thus, to choose a variety for short term stands, use the "all location" yield for "1-2 years" after seeding. For long-term stands, choose varieties based on their performance over all locations three years after seeding. Varieties with less than nine location-test years (three locations X three years) are not accurately characterized for yield performance (Tables 2C-1 and 2C-2).

Non-dormant varieties are characterized by extremely tall fall growth that continues until fall freeze-up. They produce similar yields as the moderately dormant varieties during the summer, but will 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 non-winter-hardy variety, Nitro, in 1986. Nitro is a special-purpose alfalfa designed as a one-year hay source and a fall plow down crop. It was selected 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 5715, 5888, 13R Supreme, ABT 805, Condor, DK 189, El Grande, Falcon, GT 13R Plus, Kem, Magna 8, Maricopa, Mesa, Moapa 69, Pierce, Prestige, SW 8210, WL 516, WL 525 HQ, Yolo, 5939, Baralfa 92, Coronado, CUF 101, Mecca, Mecca II, Sundor, SW 14, UC Cibola, WL 605, and WL 612.

Forage Quality

Alfalfa varieties differ in forage quality or feeding value. Alfalfa varieties have been evaluated for forage quality at Rosemount on a fee basis since 1991 (Table 4). A Standardized Forage Quality Test has been performed at Arlington, Wisconsin and Rosemount, Minnesota since 1995. Varieties in the seeding year are evaluated on one cut taken in late August. Production year evaluation (first year after seeding only) is done by analyzing each of three cuttings taken at late bud to 10 percent bloom stages of maturity.

Relative feed value index ranks varieties on their potential digestible dry matter intake. Milk per acre is estimated using a variety's crude protein and neutral detergent fiber concentrations to determine the amount of alfalfa needed to match the protein and energy needs of a 1,350 pound cow producing 60 pounds of milk per day with a diet including corn grain and minerals. Milk per acre quantifies the forage quality of an alfalfa variety as "tons per acre" multiplied by "milk per ton" (theoretical milk production per ton, calculated from protein and fiber values).

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, Verticillium wilt, and Aphanomyces root rot. Plant resistance is available for all six diseases. The 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 management (four cuts per season) in the east central and southeast area of Minnesota.

Bacterial Wilt—This disease is prevalent in most areas of the state. Wilt-susceptible varieties are poor risks and should not be grown. They generally show losses in stand by the

end of the second year after seeding. In some cases where infection is severe, stand losses are often observed by the end of the first year after seeding. Stand reductions after winter are often due to a combination of wilt damage and winter injury.

Phytophthora Root Rot—This fungal disease is a major concern on poorly drained soils especially in the east central and southeast area 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, but only in the east central and southeast area. It infects stems and crowns and kills susceptible plants. The disease is favored by hot, moist conditions, and will therefore be most frequently observed in southeast Minnesota.

Verticillium Wilt—This potentially destructive fungus disease 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 provide insurance for long-lived stands. Varieties having at least a low level of resistance are indicated in Table 2.

Aphanomyces Root Rot—This is a new disease associated with very slowly drained soils and is easily confused with Phytophthora root rot. It stunts and kills seedlings as well as causing a chronic root disease in established plants. Few cases of this disease have been identified in Minnesota, but if Phytophthora root rot resistant varieties fail to persist, then consider planting a variety with Aphanomyces resistance.

Table 1A. Fall dormancy and disease resistance of alfalfa varieties eligible for certification and marketed in Minnesota.

Note Key:

[1] Varieties includes those marketed in Minnesota for which disease resistance ratings were provided. Varieties which are not seeded in a Minnesota yield trial are excluded from Table 2.

[2] Fall Dormancy and Pest Resistance Ratings as reported in CASC publication, or provided by a developer (~). Dormancy is based on fall growth in mid-October after cutting 1st week of September . . . 9=tallest (tend to be least winter-hardy), 1=shortest.

[3] Diseases: BW=Bacterial Wilt, PRR=Phytophthora Root Rot, FW=Fusarium Wilt, AN=Anthracnose, VW=Verticillium Wilt, APH=Aphanomyces Root Rot.

[4] CASC 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).

Variety[1]	FD[2]	Disease Resistance Ratings [3, 4]					
		BW	PRR	FW	AN	VW	APH
Dormant							
120	3	HR	R	R	LR	—	—
2555ML	2	HR	HR	HR	HR	R	R
2833	3	HR	HR	HR	HR	R	—
329	3~	HR	HR	HR	HR	HR	R
3324	4~	HR	HR	HR	HR	R	R
3452-ML	3	HR	HR	HR	HR	R	R
5246	3	HR	HR	HR	HR	R	MR
5262	2	HR	R	MR	—	LR	—
5312	3	HR	HR	HR	HR	HR	R
5347LH	3~	HR	HR	HR	HR	MR	R
5454	4	R	HR	HR	HR	MR	LR
620	2	HR	HR	HR	HR	R	R
630	4	HR	R	R	MR	MR	—
631	4	HR	HR	HR	R	R	MR
8498	3~	HR	HR	HR	HR	R	R
9323	3	HR	HR	HR	R	R	HR
9326	3~	HR	HR	HR	R	R	R
A-295	2	HR	HR	HR	R	R	R
A-395	3	HR	HR	HR	HR	R	R
ABT 205	2~	HR	HR	HR	HR	HR	R
ABT 405	4~	HR	HR	HR	HR	HR	R
Ace	4	HR	HR	HR	HR	R	R
Achieva	3	R	HR	HR	HR	R	R
Affinity+Z	4	HR	HR	HR	HR	R	R
Agate	2	HR	R	HR	MR	—	—
Aggressor	4	HR	HR	HR	HR	R	MR
Alfagraze	2	R	LR	R	MR	—	—
AlfaStar	4	HR	HR	HR	HR	R	R
Allegro	4	HR	HR	HR	HR	R	R
ALPHA 2001	4	HR	HR	HR	HR	HR	R

Table 1A continued. Fall dormancy and disease resistance of alfalfa varieties eligible for certification and marketed in Minnesota.

Variety[1]	FD[2]	Disease Resistance Ratings [3, 4]					
		BW	PRR	FW	AN	VW	APH
Alpine	2	R	R	R	R	R	—
Apollo Supreme	4	HR	R	HR	HR	R	—
Arrest	3~	HR	HR	R	HR	R	R
Aspen	4	HR	HR	HR	HR	R	R
Asset	4	HR	HR	R	R	R	MR
Avalanche+Z	2	HR	HR	HR	HR	HR	R
Banquet	4	HR	HR	HR	HR	HR	R
Belmont	5	HR	R	HR	HR	R	—
Big Horn	4	HR	HR	HR	HR	R	HR
Blazer XL	3	R	HR	HR	HR	R	R
Bolt ML	3	R	HR	HR	HR	R	HR
Bounty	2	HR	HR	HR	HR	R	R
Break-Thru	3	HR	HR	HR	MR	R	—
Centurion	3	HR	R	R	R	R	—
CIBA 2444	3	HR	HR	HR	HR	R	R
CIBA 2888	3	HR	HR	HR	HR	HR	R
Cimarron VR	4	HR	R	HR	HR	R	MR
Clipper	2	HR	R	HR	R	R	—
Columbia 2000	2~	R	MR	R	MR	MR	—
Complete	3	HR	HR	HR	HR	HR	R
Crown	3	R	R	R	HR	R	—
Crown II	3	HR	HR	HR	HR	R	—
Crystal	4	HR	HR	HR	R	R	LR
Cut 'N' Graze	3	R	R	HR	MR	LR	LR
Dart	3	HR	HR	HR	R	R	—
Dawn	3~	HR	HR	HR	R	R	MR
Defiant	2	HR	HR	HR	R	HR	R
Demand	3	HR	HR	HR	HR	HR	R
Depend+EV	4	HR	HR	HR	HR	HR	R
Dividend	2	HR	HR	HR	HR	R	R
DK 122	2	HR	HR	R	HR	R	—
DK 127	3	HR	HR	R	HR	R	HR
DK 133	4	HR	HR	HR	HR	R	R
Dominator	4	HR	HR	HR	HR	R	R
Dual	4~	HR	R	HR	R	R	MR
Empire	2~	HR	HR	HR	HR	R	R
Enhancer	4	HR	HR	HR	R	R	MR
Envy	3	HR	R	HR	HR	R	—
Evolution	2	HR	HR	HR	HR	R	R
Exceed	3~	HR	HR	HR	HR	R	R
Extend	4	HR	HR	R	HR	R	R
Forerunner	2	HR	HR	HR	HR	HR	R
Fortress	4	R	HR	R	—	R	—
G 2841	3	HR	R	R	R	R	—
Garst 636	2	HR	R	R	MR	R	—

Table 1A continued. Fall dormancy and disease resistance of alfalfa varieties eligible for certification and marketed in Minnesota.

Variety[1]	FD[2]	Disease Resistance Ratings [3, 4]					
		BW	PRR	FW	AN	VW	APH
Garst 645	3	HR	HR	R	HR	R	MR
GH 755	4	HR	HR	HR	HR	R	R
GH 767	2	HR	HR	HR	HR	R	R
GH 777	3	HR	HR	HR	R	R	R
GH 787	3	HR	HR	R	HR	R	R
GH 766	3	HR	HR	HR	HR	R	R
Good as Gold	4	HR	HR	HR	R	R	LR
Gourmet Hay	4	HR	R	HR	HR	R	—
Green Field	3	HR	HR	HR	HR	R	R
Guardian	3	HR	HR	HR	HR	HR	R
HayGrazer	4~	HR	R	HR	R	R	MR
Imperial	3	HR	HR	HR	HR	R	R
Innovator +Z	3	HR	HR	HR	HR	HR	R
Iroquois	2	HR	S	MR	S	S	—
Jade	4	HR	HR	R	R	R	—
Jade II	4~	HR	HR	HR	R	R	MR
Lactator	2	HR	R	HR	HR	HR	R
Laser	4	HR	HR	HR	R	R	MR
Legend	4	HR	HR	HR	HR	R	—
LegenDairy	2	HR	HR	HR	HR	HR	R
LegenDairy 2.0	2~	HR	HR	HR	HR	R	R
Lightning	3	HR	HR	HR	HR	HR	R
MagnaGraze	3	HR	HR	HR	R	R	R
Magnum III	4	R	R	R	MR	MR	LR
Magnum III-Wet	3	R	R	R	MR	MR	MR
Magnum IV	4	HR	HR	HR	R	R	MR
Maxi-Graze 67	2~	HR	HR	HR	R	R	R
MP2000	3	HR	HR	HR	HR	R	HR
Multi-plier	3	HR	HR	HR	HR	R	—
MultiKing 1	3	HR	R	HR	R	R	—
MultiMist	3	HR	HR	HR	HR	R	R
MultiQueen	4	HR	HR	HR	HR	R	R
Notice	3	HR	HR	HR	HR	R	R
Oneida	3	HR	HR	HR	S	—	—
Oneida VR	3	R	MR	HR	MR	HR	—
Ovation	4	HR	HR	HR	HR	HR	R
Pacesetter	2	HR	HR	R	HR	R	—
Paramount	3	HR	HR	HR	HR	R	HR
Persist	4	HR	HR	HR	R	R	MR
Profit	2	HR	R	HR	MR	R	—
Proof	3	HR	HR	HR	HR	R	R
Quantum	2	HR	HR	HR	HR	HR	R
Rainier	3	HR	HR	HR	HR	R	HR
Ranger	3	MR	S	MR	S	S	—
RFV-2000	3	HR	HR	HR	HR	R	LR

Table 1A continued. Fall dormancy and disease resistance of alfalfa varieties eligible for certification and marketed in Minnesota.

Variety[1]	FD[2]	Disease Resistance Ratings [3, 4]					
		BW	PRR	FW	AN	VW	APH
Royalty	3	HR	HR	HR	HR	R	LR
Rushmore	4	HR	HR	HR	HR	R	HR
Rustler II	4~	HR	HR	HR	HR	HR	R
Saranac	4	R	S	R	S	S	—
Sierra	3	HR	HR	HR	R	R	MR
SMA-Forecast 1000	3~	HR	HR	HR	R	R	R
SMA-Forecast 3000	4~	HR	R	HR	R	R	MR
Spartan	3~	HR	HR	HR	HR	R	R
Spirit	3	HR	HR	HR	R	R	MR
Spredor 3	1	HR	MR	HR	R	MR	S
Stampede	3	HR	HR	R	—	R	R
Sterling	2	HR	HR	HR	HR	R	R
SuperCuts	4	HR	HR	HR	HR	HR	R
Surpass	3	HR	R	HR	MR	R	—
Synergy	3	HR	HR	HR	HR	R	R
Target II	4	HR	R	R	R	R	—
Teton	1	LR	LR	MR	S	—	—
Thrive	3	HR	HR	HR	HR	R	—
TMF Generation	4	HR	HR	HR	HR	HR	R
TMF Multi-plier II	3~	HR	HR	HR	HR	HR	R
Total+Z	3	HR	HR	HR	HR	HR	R
Travois	1	R	S	MR	S	—	—
Treasure	3	HR	R	HR	HR	R	—
Trident II	3	HR	HR	R	R	R	MR
UltraLeaf 87	3	HR	HR	HR	HR	R	R
Venture	4	HR	R	R	HR	R	R
Vernal	2	R	—	MR	—	—	—
Viking 1	2	R	R	HR	R	HR	—
Voyager II	4	HR	HR	HR	R	R	MR
Webfoot	3	R	R	MR	—	—	—
Webfoot MPR	4	HR	HR	HR	HR	HR	R
WetLand	3	R	HR	R	R	MR	MR
Wintergeen	3	HR	HR	HR	HR	HR	R
Winterstar	2	HR	HR	HR	HR	HR	R
WL 226	3	HR	HR	HR	HR	R	MR
WL 252 HQ	2	HR	HR	HR	HR	R	LR
WL 320	4	R	R	R	MR	MR	—
WL 322 HQ	4	HR	R	HR	MR	R	—
WL 323	4	HR	HR	HR	HR	R	R
WL 324	3	HR	HR	HR	HR	R	HR
WL 325 HQ	3	HR	HR	HR	HR	R	R
Wrangler	2	R	HR	R	LR	LR	—
Zenith	3	HR	HR	HR	HR	R	R

Table 1A continued. Fall dormancy and disease resistance of alfalfa varieties eligible for certification and marketed in Minnesota.

Variety[1]	FD[2]	Disease Resistance Ratings [3, 4]					
		BW	PRR	FW	AN	VW	APH
Non-dormant							
Nitro	8	—	MR	—	R	—	—

Table 1B. Sources of alfalfa varieties eligible for certification and marketed in Minnesota.

Note Key:

[1] Varieties includes those marketed in Minnesota for which disease resistance ratings were provided. Varieties which are not seeded in a Minnesota yield trial are excluded from Table 2.

[2] Developers list generally follows Certified Alfalfa Seed Council publication "Fall Dormancy & Pest Resistance Ratings for Alfalfa Varieties" (CASC 1996/97 Edition).

[3] Seed source numbers refer to the "key" number in Table 5, "1997 Forage Seed Sources."

Variety[1]	Developer or Marketer[2]	Seed Source[3]
Dormant		
120	DEKALB Genetics Corp.	20
2555ML	L.L. Olds/Interstate/Payco	34, 50
2833	Ciba Seeds	16, 48
329	Seed Mart, Inc.	59
3324	LG Seeds	41
3452-ML	L. L. Olds/Interstate/Payco	34, 50
5246	Pioneer Hi-Bred Int'l.	53
5262	Pioneer Hi-Bred Int'l.	53
5312	Pioneer Hi-Bred Int'l.	53
5347LH	Pioneer Hi-Bred Int'l.	53
5454	Pioneer Hi-Bred Int'l.	53
620	ICI Seeds	33
630	ICI Seeds	33
631	ICI Seeds	33
8498	Mallard Seeds	42
9323	Research Seeds/Shissler Seed	41
9326	Research Seeds/Shissler Seed	41
A-295	PGI/MBS, Inc.	43
A-395	PGI/MBS, Inc.	43
ABT 205	Seed Mart, Inc.	59
ABT 405	Seed Mart, Inc.	59
Ace	W-L Research	66
Achieva	Agway/Allied Seed	8, 9
Affinity+Z	America's Alfalfa	10
Agate	USDA/Minn.AES	1, 21, 54, 68

Table 1B continued. Sources of alfalfa varieties eligible for certification and marketed in Minnesota.

Variety[1]	Developer or Marketer[2]	Seed Source[3]
Aggressor	America's Alfalfa	1, 10, 63
Alfagraze	America's Alfalfa	1, 10, 50, 63
AlfaStar	Hoffman Seed/Sexauer	32
Allegro	Keltgen Seed/Lynks Seed	45
ALPHA 2001	Great Lakes Hybrids	27
Alpine	Oasis Seed/Spangler Seeds	49, 60
Apollo Supreme	America's Alfalfa	1, 10, 63
Arrest	Northrup King Co.	48
Aspen	SeedTec/Brown Seed Farms	12
Asset	Allied Seed	9
Avalanche+Z	America's Alfalfa	1, 10, 34, 50, 63
Banquet	Tri-State	64
Belmont	Great Plains	36
Big Horn	Cargill Hybrid Seeds	15
Blazer XL	Cenex/Land O'Lakes	17
Bolt ML	Research Seeds/Jung Farms	35
Bounty	PGI/MBS	43
Break-Thru	Custom Farm Seed	18
Centurion	Agway/Allied Seed	9
CIBA 2444	Ciba Seeds	16
CIBA 2888	Ciba Seeds	16
Cimarron VR	Great Plains	36
Clipper	Interstate/Payco Seed	34
Columbia 2000	Kaltenburg Seed Farms	1, 9, 36
Complete	Arrow Seed/Fontanelle Hybrids	23, 52
Crown	Cargill Hybrid Seeds	15
Crown II	Cargill Hybrid Seeds	15
Crystal	PGI/MBS	43
Cut 'N' Graze	AgriPro Seeds	2
Dart	AgriPro Seeds	2
Dawn	AgriPro Seeds, Inc.	2
Defiant	AgriPro Seeds	2
Demand	AgriPro Seeds	2
Depend+EV	AgriPro Seeds	2
Dividend	Agway/Allied Seed	9, 51
DK 122	DEKALB Genetics Corp.	20
DK 127	DEKALB Genetics Corp.	20
DK 133	DEKALB Genetics Corp.	20
Dominator	AgriPro Seeds	2
Dual	Kaltenburg	36
Empire	Brunner Seed	13
Enhancer	Rosen's, Inc.	58
Envy	Peterson Seed Co.	36
Evolution	Mycogen Seeds	45
Exceed	Specialty Seeds	61
Extend	Spangler/Grassland West	60
Forerunner	Research Seeds/Brown Seed	12
Fortress	Northrup King Co.	48
G 2841	Ciba Seeds	16, 48
Garst 636	ICI Seeds	33

Table 1B continued. Sources of alfalfa varieties eligible for certification and marketed in Minnesota.

Variety[1]	Developer or Marketer[2]	Seed Source[3]
Garst 645	ICI Seeds	33
GH 755	Golden Harvest	25
GH 767	Golden Harvest	25
GH 777	Golden Harvest	25, 26
GH 787	Golden Harvest	25, 26
GH 766	Golden Harvest	25
Good as Gold	Top Farm/Hoegemeyer Hybrids	43, 62
Gourmet Hay	Greenwald Elevator	28
Green Field	Hoegemeyer Hybrids	31, 54
Guardian	AgVenture	3, 4, 5, 6, 7
HayGrazer	Kaltenburg Seed Farms	36
Imperial	Top Farm Hybrids/Cole Growers	62
Innovator +Z	America's Alfalfa	10, 34, 50, 63
Iroquois	Cornell Univ.	1
Jade	NC+Hybrids	46
Jade II	NC+Hybrids	46
Lactator	Elk Mound Feed & Farm Supply	22, 52
Laser	J-V Seeds/Patriot Seeds	51
Legend	Cenex/Land O'Lakes	17
LegenDairy	Cenex/Land O'Lakes	17
LegenDairy 2.0	Cenex/Land O'Lakes	17
Lightning	Jung Seeds	35
MagnaGraze	Dairyland Seed Co.	19
Magnum III	Dairyland Seed Co.	19
Magnum III-Wet	Dairyland Seed Co.	19
Magnum IV	Dairyland Seed Co.	19
Maxi-Graze 67	Croplan Genetics	17
MP2000	Cenex/Land O'Lakes	17
Multi-plier	Mycogen Seeds	45
MultiKing 1	Northrup King	48
MultiMist	Lemke Seeds	40
MultiQueen	Fred Gutwein & Sons	24, 29
Notice	Midwest Seed Genetics	44
Oneida	Cornell Univ.	—
Oneida VR	N.Y.S.I.P.	—
Ovation	Callahan Seeds	14
Pacesetter	Research Seeds/Brown Seed	12
Paramount	Wyffels Hybrids/Chempro	66
Persist	Kaltenberg Seed Farms	36
Profit	Ciba Seeds/Wensman Seed	67
Proof	Keltgen Seed	38, 45
Quantum	Renk Seed	57
Rainier	Northrup King Co.	48
Ranger	USDA/Nebr.AES	1, 21
RFV-2000	Custom Farm Seed	18
Royalty	Cargill Hybrid Seeds	15
Rushmore	Northrup King Co.	48
Rustler II	ABI/Andrews Seed	11
Saranac	Cornell Univ.	21, 54
Sierra	NC+Hybrids	46

Table 1B continued. Sources of alfalfa varieties eligible for certification and marketed in Minnesota.

Variety[1]	Developer or Marketer[2]	Seed Source[3]
SMA-Forecast 1000	Dairyland Seed Co.	19
SMA-Forecast 3000	Dairyland Seed Co.	19
Spartan	Allied Seed	9
Spirit	Fontanelle Hybrids	23
Spredor 3	Northrup King Co.	48
Stampede	Allied Seed/Peterson Seed	52
Sterling	Cargill Hybrid Seeds	15
SuperCuts	AgriBioTech	59
Surpass	Andrews Seed	56
Synergy	Crow's Hybrid Corn	52
Target II	Bio-Plant Research	55
Teton	S.Dakota Agr.Exp.Sta.	1, 21
Thrive	Great Lakes Hybrids	27
TMF Generation	Mycogen Seeds	45
TMF Multi-plier II	Mycogen Seeds	45
Total+Z	America's Alfalfa	10, 63
Travois	S.Dakota Agr.Exp.Sta.	1, 21
Treasure	Clark Seeds	1
Trident II	Cargill Hybrid Seeds	15
UltraLeaf 87	La Crosse Seed	39
Venture	Top Farm Hybrids/Cole Growers	62
Vernal	USDA/Wisc.AES	1, 21, 54, 56, 68
Viking 1	Northrup King Co.	48
Voyager II	Lemke Seeds/Bio-Plant Res.	69
Webfoot	Great Lakes Hybrids	27
Webfoot MPR	Great Lakes Hybrids	27
WetLand	Bio-Plant Research	60, 69
Wintergeen	Renk Seed	57
Winterstar	Wensman Seed Co.	67
WL 226	W-L Research, Inc.	5, 30, 37, 47
WL 252 HQ	W-L Research, Inc.	5, 30, 37, 47
WL 320	W-L Research, Inc.	5, 30, 37, 47
WL 322 HQ	W-L Research, Inc.	5, 30, 37, 47
WL 323	W-L Research, Inc.	5, 30, 37, 47
WL 324	W-L Research, Inc.	5, 30, 37, 47
WL 325 HQ	W-L Research, Inc.	5, 30, 37, 47
Wrangler	USDA/Nebr.AES	1, 21
Zenith	ICI Seeds	33
Non-dormant		
Nitro	USDA/Minn.AES	54

Table 2A-1. Average yields of alfalfa varieties tested for Winter Survival Index expressed as percentage of Vernal for all seedings with one or more harvest years (1967-1996). Average Yield: years 1-2 after seeding and year 3 per test site. Sorted by yield for "ALL YR1-2" within each WSI category.

Note Key:

[1] Winter Survival Index from joint MN-WI trials (see Table 3).

[2] Each seeding year in any location counts as one Test Site.

[3] Total production years (after seeding year) for any location with reliable data. Two production years needed for YR1-2 data. (Seed years or production years that winterkilled or otherwise developed unacceptably variable stands are excluded.)

Locations: RoWa=Rosemount-Waseca, All Minnesota Locations=test sites including Table 2A-2.

Variety	[1] WSI	RoWa YR1-2	RoWa YR3	All Minnesota Locations		[2] Test Sites	[3] Production Yrs1-3
				YR1-2	YR3		
Superior Winter Survival							
VERNAL (T/Ac,15%MC)	1.7	6.07	5.42	5.63	5.11	70	185
ABT 205	1.6	—	—	—	—	6	3
Very Good Winter Survival							
Avalanche+Z	2.4	121	—	117	—	8	6
MP 2000	2.7	116	—	114	—	4	5
620	2.5	116	—	113	—	9	10
5454	2.3	114	—	111	110	15	21
Wintergreen	2.5	115	—	109	—	3	5
Defiant	2.3	111	—	107	—	6	8
5262	2.3	107	105	105	108	18	35
Innovator+Z	2.3	107	—	104	—	6	5
Ranger	2.8	100	101	102	102	8	24
Rushmore	2.7	107	—	101	—	5	7
DK 127	2.4	98	—	97	—	8	6
ABT 405	2.6	—	—	—	—	3	3
Notice	2.6	—	—	—	—	3	3
Good Winter Survival							
CIBA 2888	3.2	—	—	113	—	6	6
5312	3.0	113	—	107	—	8	7
Viking 1	3.0	109	95	107	100	9	17
UltraLeaf 87	3.2	107	—	107	103	6	12
Dart	3.2	108	108	106	111	13	34
Lightning	3.3	104	—	100	—	5	6
Fortress	3.8	102	84	97	90	8	24
Guardian	3.0	—	—	—	—	3	3
Columbia 2000	3.1	—	—	—	—	3	0
Rainier	3.3	—	—	—	—	3	0
SuperCuts	3.4	—	—	—	—	3	3

Table 2B-1. Average yields of alfalfa varieties with three or more seedings with one or more harvest years data (1967-1996) NOT tested for Winter Survival Index, expressed as percent of Vernal. Average Yield: years 1-2 after seeding and year 3 per test site. Sorted alphabetically.

Note Key:

[1] Each seeding year in any location counts as one Test Site.

[2] Total production years (after seeding year) for any location with reliable data. Two production years needed for YR1-2 data. (Seed years or production years that winterkilled or otherwise developed unacceptably variable stands are excluded.)

Locations: RoWa=Rosemount-Waseca, All Minnesota Locations=test sites including Table 2B-2.

Variety	RoWa		All Minnesota Locations		[1]	[2]
	YR1-2	YR3	YR1-2	YR3	Test Sites	Production Yrs1-3
120	111	115	109	112	10	29
2555 ML	112	—	112	—	6	5
2833	110	—	100	102	5	12
329	—	—	105	—	7	6
3452-ML	102	—	102	—	4	5
5246	108	98	107	103	13	24
630	110	113	107	109	11	29
631	112	—	110	—	10	12
9323	108	—	111	92	3	7
Achieva	107	91	108	91	4	9
Affinity+Z	—	—	—	—	7	4
Agate	101	110	99	106	20	56
Aggressor	101	95	101	109	10	23
Alfagraze	104	85	100	99	7	18
ALPHA 2001	—	—	—	—	4	3
Alpine	110	108	105	118	5	15
Apollo Supreme	107	108	101	105	7	20
Asset	—	85	93	98	3	8
Belmont	94	97	97	96	3	9
Blazer XL	101	—	103	101	3	8
Bounty	109	—	113	—	5	8
Break-Thru	103	95	99	95	8	21
Centurion	111	104	107	102	6	18
CIBA 2444	114	—	114	—	3	5
Cimarron VR	96	—	103	108	5	12
Clipper	104	96	103	101	10	27
Complete	—	—	—	—	3	3
Crown	109	109	107	106	6	18
Crown II	112	—	106	116	6	15
Crystal	100	95	106	112	6	14
Dawn	101	98	102	101	8	19
Demand	103	—	101	—	4	5
Depend+EV	104	—	103	—	4	5
Dividend	104	—	105	101	9	10
DK 122	104	60	104	103	18	41

Table 2B-1 continued. Average yields of alfalfa varieties with three or more seedings with one or more harvest years data (1967-1996) NOT tested for Winter Survival Index, expressed as percent of Vernal. Average Yield: years 1-2 after seeding and year 3 per test site. Sorted alphabetically.

Variety	RoWa YR1-2	RoWa YR3	All Minnesota Locations		[1]	[2]
			YR1-2	YR3	Test Sites	Production Yrs1-3
DK 133	109	96	109	103	14	25
Dominator	108	108	106	108	4	9
Empire	114	—	112	—	5	7
Enhancer	—	—	108	—	6	7
Envy	111	92	105	107	7	18
Evolution	111	99	106	99	5	10
G 2841	97	81	95	95	7	21
Garst 636	108	107	106	106	8	23
Garst 645	106	102	107	127	11	21
H 755	109	91	111	91	4	9
GH 767	123	—	109	—	4	5
GH 787	104	—	106	98	5	8
Good as Gold	108	99	110	117	7	16
Gourmet Hay	101	—	106	124	3	8
Imperial	113	103	113	103	5	6
Iroquois	104	98	106	99	10	26
Jade	—	109	113	118	6	15
Laser	115	102	112	102	3	7
Legend	97	102	96	99	6	17
LegenDairy	114	—	111	100	4	9
Magnum III	110	110	110	114	9	25
Magnum III-Wet	113	—	113	—	5	9
Magnum IV	110	107	110	107	6	12
Multi-plier	109	99	102	101	16	35
MultiKing 1	101	—	105	116	5	13
MultiQueen	—	—	111	—	3	5
Oneida	105	104	103	107	17	34
Oneida VR	—	—	—	—	7	4
Ovation	103	98	107	98	3	7
Pacesetter	104	—	107	93	3	7
Paramount	—	—	—	—	3	3
Persist	113	—	113	—	5	9
Profit	107	111	105	106	13	31
Proof	116	—	100	—	5	7
Quantum	107	99	110	99	4	9
RFV-2000	110	—	106	—	4	7
Royalty	105	97	100	99	7	18
Rustler II	112	—	112	—	4	5
Saranac	104	98	104	99	23	64
Saranac AR	105	95	102	97	19	54
Sterling	110	—	102	—	6	8
Surpass	115	108	111	107	7	18
Target II	110	84	109	96	4	10
Thrive	101	89	103	101	8	17
TMF Generation	—	—	—	—	3	3

Table 2B-1 continued. Average yields of alfalfa varieties with three or more seedings with one or more harvest years data (1967-1996) NOT tested for Winter Survival Index, expressed as percent of Vernal. Average Yield: years 1-2 after seeding and year 3 per test site. Sorted alphabetically.

Variety	RoWa	RoWa	All Minnesota		[1]	[2]
	YR1-2	YR3	Locations	YR3	Test Sites	Production Yrs1-3
Total+Z	112	—	102	—	3	5
Trident II	105	94	106	112	8	20
Venture	103	98	103	98	3	7
Voyager II	112	—	111	—	7	7
Webfoot	105	106	103	105	8	24
Webfoot MPR	102	—	103	—	5	9
Winterstar	113	—	107	—	5	6
WL 226	—	99	109	116	3	11
WL 252 HQ	—	—	107	—	5	6
WL 320	109	110	109	105	6	18
WL 322 HQ	94	104	99	112	3	9
WL 323	107	97	106	97	6	10
Wrangler	106	107	103	101	8	23
Zenith	107	—	107	111	8	17

Table 2C-1. Average yields of alfalfa varieties with less than three seedings with one or more harvest years data (1967-1996) and NOT tested for Winter Survival Index, expressed as percentage of Vernal. Average Yield: years 1-2 after seeding and year 3 per test site. Sorted alphabetically.

Note Key:

[1] Each seeding year in any location counts as one Test Site.

[2] Total production years (after seeding year) for any location with reliable data. Two production years needed for YR1-2 data. (Seed years or production years that winterkilled or otherwise developed unacceptably variable stands are excluded.)

Locations: RoWa=Rosemount-Waseca, All Minnesota Locations=test sites including Table 2C-2.

Varieties below have fewer tests and **cannot** be reliably compared with those above in 2B.

Variety	RoWa	RoWa	All Minnesota		[1]	[2]
	YR1-2	YR3	Locations	YR3	SY96 Sites	Production Yrs1-3
3324	—	—	—	—	1	1
8498	—	—	—	—	3	0
9326	—	—	—	—	2	0
A-295	110	95	110	95	3	3
A-395	108	—	108	—	3	3
AlfaStar	—	—	—	—	2	2
Allegro	109	98	99	98	2	4
Aspen	110	—	110	—	4	2
Banquet	—	—	—	—	4	2
Big Horn	—	—	—	—	2	1

Table 2C-1 continued. Average yields of alfalfa varieties with less than three seedings with one or more harvest years data (1967-1996) and NOT tested for Winter Survival Index, expressed as percentage of Vernal. Average Yield: years 1-2 after seeding and year 3 per test site. Sorted alphabetically.

Variety	RoWa YR1-2	RoWa YR3	All Minnesota Locations		[1]	[2]
			YR1-2	YR3	SY96 Sites	Production Yrs1-3
Bolt ML	111	94	111	94	1	3
Cut 'N' Graze	—	—	—	—	1	1
Exceed	—	—	—	—	3	0
Extend	110	—	110	—	4	2
Forerunner	—	—	—	—	4	1
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GH 766	—	—	—	—	3	1
GH 777	110	99	110	99	1	3
Green Field	106	100	106	100	3	5
Jade II	—	—	—	—	1	1
Lactator	107	97	107	97	3	3
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LegenDairy 2.0	—	—	—	—	3	1
MagnaGraze	113	—	113	—	2	3
Sierra	112	—	112	—	1	2
Spirit	—	—	—	—	2	1
Spredor 3	—	—	—	—	5	2
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Stampede	—	—	—	—	2	0
Synergy	103	—	103	—	1	2
Teton	—	—	102	102	1	3
TMF Multi-plier II	—	—	—	—	3	0
Travois	—	—	94	96	1	3
<hr/>						
Treasure	105	104	105	104	1	3
Wetland	109	—	109	—	4	3
WL 324	—	—	—	—	3	1
WL 325 HQ	—	—	—	—	2	0

Table 2A-2. Average yields of alfalfa varieties tested for Winter Survival Index expressed as percentage of Vernal for all seedings with one or more harvest years (1967-1996). Average Yield: years 1-2 after seeding and year 3 per test site. Sorted to match order in Table 2A-1.

Note Key:

[1] Winter Survival Index from joint MN-WI trials (see Table 3).

Locations: CrMo=Crookston-Morris, Lam=Lamberton, GRap=Grand Rapids

Variety	[1]	CrMo	CrMo	Lam	Lam	GRap	GRap
	WSI	YR1-2	YR3	YR1-2	YR3	YR1-2	YR3
Superior Winter Survival							
VERNAL (T/Ac,15%MC)	1.7	5.42	4.82	5.36	4.79	4.10	4.25
ABT 205	1.6	—	—	—	—	—	—

Table 2A-2 continued. Average yields of alfalfa varieties tested for Winter Survival Index expressed as percentage of Vernal for all seedings with one or more harvest years (1967-1996). Average Yield: years 1-2 after seeding and year 3 per test site. Sorted to match order in Table 2A-1.

Variety	[1] WSI	CrMo YR1-2	CrMo YR3	Lam YR1-2	Lam YR3	GRap YR1-2	GRap YR3
Very Good Winter Survival							
Avalanche+Z	2.4	—	—	—	—	—	—
MP 2000	2.7	—	—	—	—	—	—
620	2.5	112	—	—	—	—	—
5454	2.3	116	—	100	—	109	110
Wintergreen	2.5	—	—	—	—	102	—
Defiant	2.3	107	—	—	—	—	—
5262	2.3	106	107	101	113	105	107
Innovator+Z	2.3	—	—	—	—	—	—
Ranger	2.8	125	117	97	99	—	—
Rushmore	2.7	—	—	—	—	94	—
DK 127	2.4	—	—	—	—	—	—
ABT 405	2.6	—	—	—	—	—	—
Notice	2.6	—	—	—	—	—	—
Good Winter Survival							
CIBA 2888	3.2	128	—	104	—	—	—
5312	3.0	—	—	—	—	101	—
Viking 1	3.0	107	—	103	—	112	106
UltraLeaf 87	3.2	—	—	—	—	106	103
Dart	3.2	104	113	104	112	109	108
Lightning	3.3	—	—	—	—	—	—
Fortress	3.8	80	98	106	89	103	98
Guardian	3.0	—	—	—	—	—	—
Columbia 2000	3.1	—	—	—	—	—	—
Rainier	3.3	—	—	—	—	—	—
SuperCuts	3.4	—	—	—	—	—	—

Table 2B-2. Average yields of alfalfa varieties with three or more seedings with one or more harvest years data (1967-1996) NOT tested for Winter Survival Index, expressed as percent of Vernal. Average Yield: years 1-2 after seeding and year 3 per test site. Sorted alphabetically.

Note Key:

Locations: CrMo=Crookston-Morris, Lam=Lamberton, GRap=Grand Rapids

Variety	CrMo YR1-2	CrMo YR3	Lam YR1-2	Lam YR3	GRap YR1-2	GRap YR3
120	103	107	103	—	112	107
2555 ML	—	—	—	—	—	—
2833	89	102	104	101	—	—
329	108	—	107	—	—	—
3452 ML	—	—	—	—	—	—

Table 2B-2 continued. Average yields of alfalfa varieties with three or more seedings with one or more harvest years data (1967-1996) NOT tested for Winter Survival Index, expressed as percent of Vernal. Average Yield: years 1-2 after seeding and year 3 per test site. Sorted alphabetically.

Variety	CrMo YR1-2	CrMo YR3	Lam YR1-2	Lam YR3	Grap YR1-2	Grap YR3
5246	114	—	99	—	102	109
630	102	100	107	107	99	112
631	118	—	99	—	—	—
9323	—	—	—	—	115	92
Achieva	111	—	—	—	—	—
Affinity+Z	—	—	—	—	—	—
Agate	97	101	100	100	89	96
Aggressor	103	109	102	126	99	107
Alfagraze	—	—	101	117	103	94
ALPHA 2001	—	—	—	—	—	—
Alpine	95	120	112	123	—	—
Apollo Supreme	90	103	100	99	107	112
Asset	69	99	—	—	—	—
Belmont	105	108	94	83	—	—
Blazer XL	101	98	105	103	—	—
Bounty	116	—	—	—	—	—
Break-Thru	88	97	102	93	103	93
Centurion	100	97	104	97	114	112
CIBA 2444	—	—	—	—	—	—
Cimarron VR	110	111	110	111	100	101
Clipper	102	107	100	91	106	102
Complete	—	—	—	—	—	—
Crown	92	98	123	114	113	105
Crown II	96	107	110	124	—	—
Crystal	104	112	117	144	—	—
Dawn	107	112	—	—	94	98
Demand	—	—	—	—	—	—
Depend+EV	—	—	—	—	103	—
Dividend	—	—	—	—	115	101
DK 122	102	108	107	120	104	100
DK 133	108	115	109	—	110	98
Dominator	—	—	99	—	—	—
Empire	118	—	—	—	—	—
Enhancer	116	—	103	—	—	—
Envy	101	112	102	110	—	—
Evolution	104	—	—	—	98	—
G 2841	79	92	103	105	105	105
Garst 636	105	108	101	105	103	102
Garst 645	111	129	106	151	—	—
GH 755	117	—	—	—	—	—
GH 767	—	—	—	—	93	—
GH 787	—	—	—	—	109	98
Good as Gold	113	117	104	135	108	115
Gourmet Hay	113	130	103	118	—	—
Imperial	—	—	—	—	—	—

Table 2B-2 continued. Average yields of alfalfa varieties with three or more seedings with one or more harvest years data (1967-1996) NOT tested for Winter Survival Index, expressed as percent of Vernal. Average Yield: years 1-2 after seeding and year 3 per test site. Sorted alphabetically.

Variety	CrMo YR1-2	CrMo YR3	Lam YR1-2	Lam YR3	GRap YR1-2	GRap YR3
Iroquois	105	103	100	99	111	96
Jade	116	121	107	131	109	108
Laser	117	—	103	—	—	—
Legend	89	98	101	91	101	103
LegenDairy	—	—	—	—	104	100
Magnum III	106	103	116	132	104	108
Magnum III-Wet	111	—	—	—	—	—
Magnum IV	114	—	107	—	—	—
Multi-plier	100	109	99	83	100	100
MultiKing 1	109	119	117	141	96	87
MultiQueen	127	—	102	—	—	—
Oneida	102	114	94	97	105	107
Oneida VR	—	—	—	—	—	—
Ovation	113	—	—	—	—	—
Pacesetter	—	—	—	—	112	93
Paramount	—	—	—	—	—	—
Persist	121	—	105	—	—	—
Profit	104	93	106	112	101	111
Proof	—	—	—	—	90	—
Quantum	118	—	—	—	—	—
RFV-2000	107	—	101	—	—	—
Royalty	90	99	101	107	102	95
Rustler II	—	—	—	—	—	—
Saranac	106	109	102	96	—	—
Saranac AR	100	101	100	97	95	109
Sterling	—	—	—	—	94	—
Surpass	104	105	108	105	108	110
Target II	111	106	—	—	105	97
Thrive	106	103	102	—	106	110
TMF Generation	—	—	—	—	—	—
Total+Z	—	—	94	—	—	—
Trident II	106	113	108	134	104	106
Venture	—	—	—	—	—	—
Voyager II	—	—	—	—	—	—
Webfoot	104	104	100	109	102	102
Webfoot MPR	108	—	100	—	—	—
Winterstar	—	—	—	—	100	—
WL 226	112	123	111	127	—	—
WL 252 HQ	106	—	107	—	—	—
WL 320	106	102	112	105	112	102
WL 322 HQ	110	121	92	113	—	—
WL 323	109	—	101	—	—	—
Wrangler	106	103	98	106	100	91
Zenith	108	105	107	117	—	—

Table 2C-2. Average yields of alfalfa varieties with less than three seedings with one or more harvest years data (1967-1996) and NOT tested for Winter Survival Index, expressed as percentage of Vernal. Average Yield: years 1-2 after seeding and year 3 per test site. Sorted alphabetically.

Note Key:

Locations: CrMo=Crookston-Morris, Lam=Lamberton, GRap=Grand Rapids

Varieties below have fewer tests and **cannot** be reliably compared with those above in 2B.

Variety	CrMo YR1-2	CrMo YR3	Lam YR1-2	Lam YR3	GRap YR1-2	GRap YR3
3324	—	—	—	—	—	—
8498	—	—	—	—	—	—
9326	—	—	—	—	—	—
A-295	—	—	—	—	—	—
AlfaStar	97	106	—	—	—	—
Allegro	—	—	—	—	—	—
Aspen	—	—	105	109	—	—
Banquet	—	—	—	—	—	—
Bolt ML	—	—	—	—	—	—
Cut 'N' Graze	—	—	—	—	—	—
Exceed	—	—	—	—	—	—
Extend	—	—	—	—	—	—
GH 766	—	—	—	—	—	—
GH 777	—	—	—	—	—	—
Green Field	—	—	106	—	—	—
Jade II	—	—	—	—	—	—
LegenDairy 2.0	—	—	—	—	—	—
MagnaGraze	—	—	—	—	—	—
Sierra	—	—	—	—	—	—
Spirit	—	—	—	—	—	—
Stampede	—	—	—	—	—	—
Synergy	—	—	—	—	—	—
Teton	102	102	—	—	—	—
TMF Multi-plier II	—	—	—	—	—	—
Treasure	—	—	—	—	—	—
Wetland	—	—	—	—	—	—
WL 324	—	—	—	—	—	—
WL 325 HQ	—	—	—	—	—	—

Table 3. 1996 Winter Survival Test Results (joint Minnesota / Wisconsin trials).

Note Key:

Winter Survival Index categories: 1=superior; 2=very good; 3=good; 4=adequate; 5=low; 6=none.

Planted in 1995. Rated during May, 1996. Check varieties: (ck).

Variety	Winter Survival Index			Mean
	Morris MN	Arlington WI	Marshfield WI	
Norseman (ck)	1.3	1.0	0.7	1.0
ABT 205	1.9	1.6	1.5	1.6
Vernal (ck)	2.1	1.4	1.6	1.7
5262	2.6	2.1	2.2	2.3
Defiant	2.6	2.1	2.2	2.3
5454	2.5	2.3	2.2	2.3
Innovator+Z	2.5	2.2	2.3	2.3
Avalanche+Z	2.9	2.0	2.3	2.4
DK 127	2.7	2.2	2.3	2.4
Wintergreen	2.6	2.4	2.5	2.5
620	2.9	2.2	2.4	2.5
Notice	2.9	2.4	2.5	2.6
ABT 405	3.1	2.2	2.6	2.6
MultiMist	2.9	2.4	2.6	2.7
MP 2000	3.0	2.6	2.6	2.7
Rushmore	2.9	2.5	2.8	2.7
Ranger (ck)	3.0	2.5	2.7	2.8
526 (ck)	3.1	2.5	2.6	2.8
Rainier	3.3	2.5	2.6	2.8
645	3.2	2.6	2.7	2.8
5312	3.3	2.8	2.8	3.0
Guardian	3.2	2.8	2.9	3.0
Viking 1	3.3	2.8	2.8	3.0
Columbia 2000	3.6	2.8	2.9	3.1
Ciba 2888	3.7	3.0	3.0	3.2
Dart (ck)	3.6	3.0	3.1	3.2
UltraLeaf 87	3.8	2.9	3.0	3.2
Lightning	3.7	3.0	3.1	3.3
SuperCuts	3.9	3.0	3.2	3.4
Fortress (ck)	4.2	3.6	3.5	3.8
Archer (ck)	4.7	4.0	3.9	4.2
Southern Special (ck)	5.9	4.9	4.9	5.2
Moapa 69 (ck)	6.2	6.0	5.7	6.0
Cuf 101 (ck)	6.3	6.2	5.8	6.1

Table 4. Forage quality and milk per acre of alfalfa varieties, as percent of check entry. Sorted alphabetically.

Note Key:

* Not significantly different from highest variety in trial.

[1] Varieties listed include joint MN-WI quality trials (1995-96), plus varieties from prior MN quality trials that are currently marketed in MN. (MN Seed Year 1994 winterkilled, reseeded in 1995, is included here in MN SY 1995/PY 1996).

[2] RFV=Relative Feed Value index (calculated from NDF and ADF).

[3] Milk per acre uses season average quality and season average yield at Rosemount, MN.

[4] Milk per acre uses season average quality and season average yield at Arlington, WI.

[5] Checks: Vernal used until 1994; Vernal and WL 322 HQ for 1995-96 seed years.

[6] CV=Coefficient of Variation. Smaller number indicates less variation between replicates.

[1] Variety	Minnesota (SY=Seed Yr) (PY=Prod.Yr)			Minnesota		Wisconsin		Minnesota		Wisconsin	
	SY 1991-92-93 PY 1992-93-94			SY 1995 PY 1996		SY 1995 PY 1996		SY 1996 PY 1996		SY 1996 PY 1996	
	[2] RFV	[3] Milk	N	[2] RFV	[3] Milk	[2] RFV	[4] Milk	[2] RFV	[3] Milk	[2] RFV	[4] Milk
2833	110	109	1	—	—	—	—	—	—	—	—
5246	104	107	2	—	—	—	—	—	—	—	—
5454	102	105	1	—	—	—	—	—	—	—	—
630	107	109	1	—	—	—	—	—	—	—	—
8498	—	—	—	—	—	—	—	100*	109*	100	107
9326	—	—	—	—	—	—	—	102*	98*	110*	105
ABT 205	—	—	—	—	—	—	—	92	106*	103	102
Ciba 2888	—	—	—	104*	102	101*	117*	—	—	—	—
Dart	106	99	1	—	—	—	—	—	—	—	—
Dawn	102	110	1	—	—	—	—	—	—	—	—
Dividend	108	104	1	—	—	—	—	—	—	—	—
DK 122	107	106	2	97	114*	—	—	—	—	—	—
DK 127	—	—	—	105*	112*	105*	120*	94*	97	104	110
DK 133	107	107	2	98	109*	—	—	100*	104*	94	113*
Dominator	105	98	1	—	—	—	—	—	—	—	—
Exceed	—	—	—	—	—	—	—	94*	112*	97	109
Extend	—	—	—	—	—	—	—	91	101*	103	104
Garst 645	106	105	1	—	—	—	—	—	—	—	—
GH 755	108	102	1	—	—	—	—	—	—	—	—
GH 766	—	—	—	100	106*	—	—	—	—	—	—
GH 767	—	—	—	104*	97	104*	120*	99*	100*	114*	110
GH 787	—	—	—	106*	95	102*	119*	102*	113*	97	113*
Good As Gold	105	102	1	—	—	—	—	—	—	—	—
Imperial	102	109	1	—	—	—	—	—	—	—	—
Innovator +Z	—	—	—	104*	110*	—	—	—	—	—	—

Table 4 continued. Forage quality and milk per acre of alfalfa varieties, as percent of check entry. Sorted alphabetically.

Variety	Minnesota			Minnesota		Wisconsin		Minnesota		Wisconsin	
	SY'91-92-93			SY 1995		SY 1995		SY 1996		SY 1996	
	[1]	[2]	[3]	[2]	[3]	[2]	[4]	[2]	[3]	[2]	[4]
(SY=Seed Yr)	PY'92-93-94			PY 1996		PY 1996		PY 1996		PY 1996	
(PY=Prod.Yr)	RFV	Milk	N	RFV	Milk	RFV	Milk	RFV	Milk	RFV	Milk
LegenDairy	110	104	1	—	—	—	—	—	—	—	—
Lightning	—	—	—	106*	102	99*	115*	—	—	—	—
Magnum III	102	105	1	—	—	—	—	—	—	—	—
Magnum III-Wet	111	102	1	—	—	—	—	—	—	—	—
Magnum IV	99	102	1	—	—	—	—	—	—	—	—
Max 329	—	—	—	—	—	—	—	97*	102*	100	123*
MultiKing 1	109	102	3	—	—	—	—	—	—	—	—
Oneida	104	106	2	—	—	—	—	—	—	—	—
Profit	109	103	1	—	—	—	—	—	—	—	—
Rainier	—	—	—	—	—	—	—	103*	101*	100	108
Rushmore	—	—	—	96	111*	—	—	—	—	—	—
Saranac AR	108	102	3	—	—	—	—	—	—	—	—
Spirit	—	—	—	—	—	—	—	99*	115*	92	114*
Sierra	103	109	1	—	—	—	—	—	—	—	—
Sterling	—	—	—	100	112*	—	—	—	—	—	—
Thrive	102	103	1	—	—	—	—	—	—	—	—
UltraLeaf 87	—	—	—	106*	98	101*	112*	—	—	—	—
Vernal	100	100	3	95	95	102	98	98*	108*	100	100
Viking 1	106	103	1	—	—	—	—	—	—	—	—
WL 252 HQ	108	105	1	107*	101	99*	115*	—	—	—	—
WL 322 HQ	110	105	2	105*	105	97	103	102*	92	—	—
Vernal/Chk[5]	124	13754	3	164	8667	190	12096	193	2643	206	5532
Test Mean	132	14251	3	171	9064	—	—	189	2740	—	—
LSD .05				6	9	7	11	10	17	9	13
CV [6]				4.4	6.6	5.0	6.2	7.1	11.7	6.5	8.3

Table 5. Forage Seed Sources, 1997. Listed alphabetically.

Note Key:

Numbering to left of each seed vendor is keyed to Seed Source column in Table 1.

1. Agassiz Seed & Supply ... 445 7th St. NW ... West Fargo, ND 58078 ... 701-282-8118
2. AgriPro Seeds, Inc. ... PO Box 2962 ... Shawnee Mission, KS 66201 ... 913-384-4940
3. AgServices ... 1395 Roberts Road ... Hutchinson, MN 55350 ... 320-587-8972
4. AgVenture Central ... Box 296 ... Madison Lake, MN 56063 ... 507-243-3232
5. AgVenture East ... Rte 2, Box 58 ... Kasson, MN 55944 ... 800-657-4890

Table 5 continued. Forage Seed Sources, 1997. Listed alphabetically.

6. AgVenture West ... Box 184 ... Jeffers, MN 56145 ... 507-628-4929
7. AgVenture West Central ... Rte. 2, Box 134 ... Olivia, MN 56277 ... 320-523-2250
8. Albert Lea Seedhouse ... 1414 West Main ... Albert Lea, MN 56007 ... 507-373-3161
9. Allied Seed Cooperative ... PO Box 945 ... Angola, IN 46703 ... 800-813-5025
Allied Seed Cooperative ... 12 Hilldale Drive ... Macon, MO 63552 ... 800-624-8904
10. America's Alfalfa ... PO Box 2962 ... Shawnee Mission, KS 66201 ... 913-384-4940
11. Andrews Seed Co. ... 580 S Oregon ... Ontario, OR 97914 ... 541-889-9109
12. Brown Seed Farms ... N 1279 530th St. ... Bay City, WI 54723 ... 715-594-3003
13. Brunner Seed ... Rte 2, Box 273 ... Durand, WI 54736 ... 715-672-5887
14. Callahan Seeds ... 1122 E 169th St. ... Westfield, IN 46074 ... 317-896-5551
15. Cargill Hybrid Seeds ... Rte 1, Box 56 ... Plainview, MN 55964 ... 507-534-2128
16. CIBA Seeds ... PO Box 6346 ... Rochester, MN 55903 ... 507-280-0747
17. Croplan Genetics ... PO Box 64089, Cenex/Land O' Lakes ... St. Paul, MN 55164 ...
612-451-5490
18. Custom Farm Seed ... Box 160 ... Momence, IL 60954 ... 815-472-2433
19. Dairyland Seed Co. ... PO Box 958 ... West Bend, WI 53095 ... 800-236-0163
20. DEKALB Genetics Corp. ... 7665 Commerce Way, Suite 101 ... Eden Prairie, MN
55344 ... 612-934-2741
21. Discount Farm Center ... PO Box 84, West Hwy 212 ... Watertown, SD 57201 ...
605-886-5888
22. Elk Mound Seed ... PO Box 187, 308 Railroad Ave. ... Elk Mound, WI 54739 ...
715-879-5556
23. Fontanelle Hybrids ... 10981 8th St. ... Nickerson, NE 68044 ... 402-721-1410
24. Fred Gutwein & Sons ... RR 1, Box 40 ... Francesville, IN 47946 ... 219-567-9141
25. Golden Harvest Seeds ... 27420 137th Ave. N ... Cordova, IL 61242 ... 309-654-2234
Golden Harvest Seeds ... PO Box A, 100 J.C. Robinson Blvd. ... Waterloo, NE 68069
... 402-779-2531
26. Golden Seed Co. LLC ... 251 West Main St. ... Wabasha, MN 55981 ... 612-565-2945
27. Great Lakes Hybrids ... 19 Lamar Court ... North Mankato, MN 56003 ...
800-257-7333
28. Greenwald Elevator ... 151 First Ave. S ... Greenwald, MN 56335 ... 612-937-3159
29. Gutwein/Blaney Seeds ... RR1, Box 175 ... Sleepy Eye, MN 56085 ... 507-794-4203
30. Harvest States Coop/GTA Feeds ... 17944 82nd Way ... Maple Grove, MN 55311 ...
612-420-7712
31. Hoegemeyer Hybrids ... Rte 2, Box 126 ... Hooper, NE 68031 ... 402-654-3399
32. Hoffman Seeds ... 144 Main St. ... Landisville, PA 17538 ... 717-898-2261
33. ICI Seeds/Garst Seeds ... PO Box 300 ... Coon Rapids, IA 50058 ... 800-831-1850
34. Interstate Payco Seed Co. ... PO Box 70 ... Dassel, MN 55325 ... 320-286-5511
35. Jung Seed Genetics ... 1229 NW 41st St. ... Rochester, MN 55901 ... 507-288-1930
Jung Seed Genetics ... 335 South High St. ... Randolph, WI 53957 ... 800-242-1855
36. Kaltenberg Seed Farms Inc. ... 20155 Biscayne Ave. W ... Farmington, MN 55024 ...
612-463-8997
Kaltenberg Seed Farms Inc. ... PO Box 278 ... Waunakee, WI 53597 ... 608-849-5021
37. Kaystar Seed ... Box 947 ... Huron, SD 57350 ... 800-288-8791
38. Keltgen Seed Co. ... Box 209 ... Olivia, MN 56277 ... 800-535-8436
39. La Crosse Seed Corp. ... PO Box 187 ... LaCrosse, WI 54601 ... 608-781-4848
40. Lemke Seeds ... 10220 N Granville Rd. ... Mequon, WI 53092 ... 414-242-2647

Table 5 continued. Forage Seed Sources, 1997. Listed alphabetically.

41. LG Seeds ... PO Box 216, 925 Dexter ... Prescott, WI 54021 ... 800-637-2887
42. Mallard Seed ... PO Box 637 ... Plainview, MN 55964 ... 507-534-2300
43. MBS Inc. ... 225 West 1st St. ... Story City, IA 50248 ... 515-733-5274
44. Midwest Seed Genetics ... PO Box 518 ... Carroll, IA 51401 ... 712-792-6691
45. Mycogen Plant Sciences ... 720 St. Croix ... Prescott, WI 54021 ... 800-321-2867
46. NC+ Hybrids ... RR 2, Box 52 ... Sanborn, MN 56083 ... 507-648-3378
47. Norco Feeds ... PO Box 56 ... Norfolk, NE 68702 ... 800-658-4388
48. Northrup King Co. ... PO Box 959 ... Minneapolis, MN 55440 ... 612-593-7261
49. Oasis Seed ... P.O. Box 107 ... Oasis, WI 64650 ... 801-864-3614
50. Olds/Payco Seed Co. ... Box 7790 ... Madison, WI 53707 ... 800-356-7333
51. Patriot Seed, Inc. ... PO Box 97, 208 South Warrell ... Bowen, IL 62316 ... 217-842-5612
52. Peterson Seed Co., Inc. ... Box 346 ... Savage, MN 55436 ... 612-445-2606
53. Pioneer Hi-Bred Int'l, Inc. ... 130 Willmar Ave. SE ... Willmar, MN 56201 ... 320-235-7420
54. Premium Seed Co., Inc. ... 7800 E State Hwy 101 ... Shakopee, MN 55379 ... 612-496-1783
55. Producers Hybrids, Inc. ... Box C ... Battle Creek, NE 68715 ... 402-675-2975
56. R.J. Hunt Seed Co. ... RR 1, Box 112 ... Wadena, MN 56482 ... 218-631-4190
57. Renk Seed Company ... 6800 Wilburn Rd. ... Sun Prairie, WI 53590 ... 608-837-7351
58. Rosens Inc. ... 700 SW Hwy. 291, Suite 204 ... Liberty, MO 64068 ... 816-781-9191
59. Seed Mart, Inc. ... PO Box 126, 925 Dexter St. ... Prescott, WI 54021 ... 715-262-4430
60. Spangler Seeds ... 803 W. Racine St. ... Jefferson, WI 53549 ... 414-674-4606
61. Specialty Seeds ... 26787 Hillhaven Drive ... Cold Spring, MN 56320 ... 612-685-4520
62. Top Farm Hybrids ... 17177 60th St. SW ... Cokato, MN 55321 ... 320-286-5516
63. Trelay Inc. ... 11623 Hwy 80 N ... Livingston, WI 53554 ... 800-421-0397
64. Tri-State Seed ... Box 354 ... Sleepy Eye, MN 56085 ... 507-794-3078
65. Twin Cities Seeds ... 7265 Washington Ave. S ... Edina, MN 55439 ... 612-944-7105
66. W-L Research, Inc. ... 8701 W U.S. Hwy 14 ... Evansville, WI 53536 ... 608-882-4100
67. Wensman Seed Co. ... Box 190, 102 Aldrich Ave. SE ... Wadena, MN 56482 ... 218-631-2954
68. Werner Farm Seeds ... 3104 Millersburg Blvd. ... Dundas, MN 55019 ... 507-645-7995
69. Ziller Seed Co., Inc. ... RR 1, Box 122 ... Bird Island, MN 55310 ... 320-365-3674

Alfalfa Planting Rate and Date

Rate is based on normal seedbeds and on normal size, good quality seed. Rate used can vary greatly depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting and planting equipment. Weight given is the most widely accepted in the U.S.

Crop Use	Bushel Weight (pounds)	Seeds/pound (number)	Rate/acre (pounds)	Rate (seeds)	Planting Date
Alone	60	199,000	11	50/square foot	Early spring to August 10
With grass			7	32/square foot	

For Crop Production 1997 _____

BIRDSFOOT TREFOIL VARIETY TRIALS

**Minnesota Agricultural Experiment Station — University of Minnesota
December 1996**

Results of Birdsfoot Trefoil Variety Tests Conducted by the Minnesota Agricultural Experiment Station. This report was prepared by Nancy J. Ehlke, agronomist, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108. [phone: 612/625-1791; e-mail: <ehlke001@maroon.tc.umn.edu>].

Crop Background

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, and persists longer and performs better than other legumes under poor soil conditions such as low fertility, acidity and poor drainage. It is also persistent when grown with Kentucky bluegrass and timothy.

Performance trials of birdsfoot trefoil were reestablished at Rosemount and Grand Rapids in 1993 and 1994. The trial was harvested twice at Grand Rapids and three times at Rosemount from 1994 through 1996. Yields were lower at Grand Rapids than Rosemount, due to less favorable growing conditions.

Winter-hardy varieties such as Norcen 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.

Table 1. Dry matter yield of birdsfoot trefoil varieties, in tons per acre, seeded at Grand Rapids and Rosemount (1994-1996). [1]

Note Key:

[1] Trials were established in 1993 and 1994 at Rosemount and Grand Rapids.

[2] Severe winter injury in 1995.

Variety	1994	Rosemount			Grand Rapids			
		1995 [2]	1995	1996	1994	1995	1995	1996
AU-Dewey	3.8	0.9	—	—	2.6	2.3	—	—
Carroll	4.3	3.8	—	—	2.7	3.2	—	—
Dawn	—	—	—	—	2.5	2.5	—	—
Empire	—	—	4.8	2.4	2.7	2.8	2.4	1.9
Fergus	3.9	4.0	—	—	2.8	2.9	—	—
Leo	—	—	4.7	2.2	—	—	2.5	2.1
Norcen	3.9	3.7	4.9	2.2	2.9	2.7	2.3	2.0
Viking	—	—	4.6	2.6	—	—	2.4	2.0
LSD 0.05	NS	0.5	NS	NS	0.4	0.2	0.2	0.2

Table 2. Birdsfoot trefoil seed sources for 1997 production. Alphabetical listing, with marketed variety noted with each entry.

Marketer	Variety
Agassiz Seed & Supply 445 7th St. NW ... West Fargo, ND 58078 ... 701-282-8118	<i>Empire, Norcen</i>
Croplan Genetics PO Box 64089, Cenex/Land O'Lakes ... St. Paul, MN 55164 ... 612-451-5490	<i>Empire, Norcen</i>
Kaltenberg Seed Farms Inc. 20155 Biscayne Ave. W ... Farmington, MN 55024 ... 612-463-8997 PO Box 278 ... Waunakee, WI 53597 ... 608-849-5021	<i>Empire, Norcen</i>
La Crosse Seed Corp. PO Box 187 ... La Crosse, WI 54601 ... 608-781-4848	<i>Norcen</i>
Olds/Payco Seed Co. Box 7790 ... Madison, WI 53707 ... 800-356-7333	<i>Empire, Norcen</i>
Peterson Seed Co., Inc. Box 346 ... Savage, MN 55436 ... 612-445-2606	<i>Empire, Leo, Norcen</i>
Premium Seed Co., Inc. 7800 E State Hwy 101 ... Shakopee, MN 55379 ... 612-496-1783	<i>Empire, Norcen</i>
R.J. Hunt Seed Co. RR 1, Box 112 ... Wadena, MN 56482 ... 218-631-4190	<i>Empire, Norcen</i>
Twin Cities Seed 7265 Washington Ave. S ... Edina, MN 55439 ... 612-944-7105	<i>AU-Dewey</i>
Werner Farm Seeds 3104 Millersburg Blvd. ... Dundas, MN 55019 ... 507-645-7995	<i>Empire, Norcen</i>

Birdsfoot Trefoil Planting Rate and Date

Rate is based on normal seedbeds and on normal size, good quality seed. Rate used can vary greatly depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting and planting equipment. Weight given is the most widely accepted in the U.S.

Crop Use	Bushel Weight (pounds)	Seeds/pound (number)	Rate/acre (pounds)	Rate (seeds)	Planting Date
Alone	60	372,000	7	60/square foot	Early spring or summer
With grass			4	34/square foot	

For Crop Production 1997 _____

RED CLOVER VARIETY TRIALS

**Minnesota Agricultural Experiment Station — University of Minnesota
December 1996**

Results of Red Clover Variety Tests Conducted by the Minnesota Agricultural Experiment Station. This report was prepared by Nancy J. Ehlke, agronomist, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108. [phone: 612/625-1791; e-mail: <ehlke001@maroon.tc.umn.edu>].

Crop Background

Red clover can be seeded either in pure stands or with timothy for hay or silage. It is more easily established in pasture renovation than either alfalfa or trefoil.

Historically, the winter-hardy varieties of red clover have not persisted beyond two crop years in Minnesota because they are susceptible to diseases. However, most of the improved varieties currently sold for use in Minnesota can persist for three years if the weather provides good winter snow cover.

Minnesota Agricultural Experiment Station scientists established performance trials of red clover at three locations in 1991 and 1995. Stands from the 1991 trials were sufficient for data collection only at Grand Rapids in 1992 and 1993, and at Rosemount from 1992 to 1994. The trials established in 1995 were harvested at Grand Rapids, Morris and Rosemount in 1996.

No differences in dry matter yield were found in the 1991 trial between the varieties harvested at either trial location during either 1992 or 1993, though yields and stands were better at Rosemount than Grand Rapids in both years. Marathon produced the highest forage yield during the third production year at Rosemount.

In the 1995 trials, varietal differences for forage yield were found at Grand Rapids and Rosemount. Yields were highest at Grand Rapids due to favorable environmental conditions, and lowest at Rosemount due to winter injury.

Table 1. Percent stand and vigor of red clover varieties seeded at three locations (Grand Rapids, Morris and Rosemount) in 1991 and 1995. [1]

Note Key:

[1] Trials established in 1991 and 1995 were harvested three times per year.

[2] Percent stand rated at Rosemount on May 20, 1996.

[3] Vigor rated at Rosemount on May 20, 1996: 1=least vigorous, 5=most vigorous.

Variety	Stand [2]	Vigor [3]
Acclaim	—	—
Arlington	94	3.8
Astrid	68	3.3
Cinnamon	92	4.3
Concord	—	—
Marathon	91	3.9
Randolph	85	3.8
Redland III	—	—
Red Star	—	—
Scarlett	90	4.0
LSD 0.05	26	0.5

Table 2. Dry matter yield of red clover varieties, tons per acre, seeded at three locations (1992-1994; 1996). [1]

Note Key:

[1] Trials established in 1991 and 1995 were harvested three times per year.

[2] Residual harvest taken at Rosemount on June 3, 1994.

Variety	Grand Rapids			Rosemount				Morris 1996 [2]
	1992	1993	1996	1992	1993	1994	1996	
Acclaim	3.2	3.0	—	5.4	4.5	1.3	—	—
Arlington	2.9	3.0	3.7	5.1	4.4	1.2	2.6	3.2
Astrid	—	—	3.3	—	—	—	2.2	2.5
Cinnamon	—	—	4.0	—	—	—	3.1	3.4
Concord	—	—	4.3	—	—	—	—	—
Marathon	2.9	3.2	4.3	5.1	4.7	1.5	3.2	3.4
Randolph	—	—	3.8	—	—	—	3.7	3.8
Redland III	—	—	—	—	—	—	—	3.3
Red Star	3.1	3.4	—	5.3	4.8	1.0	—	—
Scarlett	—	—	3.0	—	—	—	3.0	3.7
LSD 5%	NS	NS	0.9	NS	NS	0.3	0.9	NS

Table 3. Red clover seed sources for 1997 production. Alphabetical listing, with marketed variety noted with each entry.

Marketer	Variety
Agassiz Seed & Supply 445 7th St. NW ... West Fargo, ND 58078 ... 701-282-8118	<i>Arlington</i>
Allied Seed Cooperative PO Box 945 ... Angola, IN 46703 ... 800-813-5025 12 Hilldale Drive ... Macon, MO 63552 ... 800-624-8904	<i>Acclaim, Cinnamon</i>
Jung Seed Genetic 1229 NW 41st St. ... Rochester, MN 55901 ... 507-288-1930 335 South High St. ... Randolph, WI 53957 ... 800-242-1855	<i>Randolph</i>
Kaltenberg Seed Farms Inc. 20155 Biscayne Ave. W ... Farmington, MN 55024 ... 612-463-8997 PO Box 278 ... Waunakee, WI 53597 ... 608-849-5021	<i>Arlington, Marathon</i>
La Crosse Seed Corp. PO Box 187 ... La Crosse, WI 54601 ... 608-781-4848	<i>Arlington, Marathon</i>
Peterson Seed Co., Inc. Box 346 ... Savage, MN 55436 ... 612-445-2606	<i>Marathon</i>
Premium Seed Co., Inc. 7800 E State Hwy 101 ... Shakopee, MN 55379 ... 612-496-1783	<i>Arlington, Marathon</i>
R.J. Hunt Seed Co. RR 1, Box 112 ... Wadena, MN 56482 ... 218-631-4190	<i>Arlington, Marathon</i>
Top Farm Hybrids 17177 60th St. SW ... Cokato, MN 55321 ... 320-286-5516	<i>Arlington, Marathon</i>
Werner Farm Seeds 3104 Millersburg Blvd. ... Dundas, MN 55019 ... 507-645-7995	<i>Arlington, Marathon</i>

Red Clover Planting Rate and Date

Rate is based on normal seedbeds and on normal size, good quality seed. Rate used can vary greatly depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting and planting equipment. Weight given is the most widely accepted in the U.S.

Crop Use	Bushel Weight (pounds)	Seeds/pound (number)	Rate/acre (pounds)	Rate (seeds)	Planting Date
Alone	60	252,000	9	50/square foot	Early spring to August 10
With Grass			5	30/square foot	

REED CANARYGRASS VARIETY TRIALS

**Minnesota Agricultural Experiment Station — University of Minnesota
December 1996**

Results of Reed Canarygrass Variety Tests Conducted by the Minnesota Agricultural Experiment Station. This report was prepared by Nancy J. Ehlke, agronomist, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108. [phone: 612/625-1791; e-mail: <ehlke001@maroon.tc.umn.edu>].

Crop Background

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 and tolerates flooding better than other cool season grasses. The species utilizes nitrogen efficiently and is adapted to liquid manure application. However, 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 most recent developments in reed canarygrass breeding have been the release of several varieties low in indole alkaloid concentration. This dramatically improves palatability and animal performance. Alkaloids are bitter, complex, nitrogen containing compounds.

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.

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. Trials were also established in 1993 at Morris, Grand Rapids and Rosemount, and these trials were harvested twice at Grand Rapids and Rosemount in 1994, and three times at Morris. In 1995 and 1996, the trials were harvested three times per year. Nitrogen was applied early in the spring and after each harvest at rates of between 40 and 50 pounds per acre.

Each of the available varieties of reed canarygrass are winter-hardy and persistent in Minnesota. High yielding, low alkaloid varieties Palaton and Venture are currently marketed here.

Table 1A. Dry matter yields of reed canarygrass varieties, tons per acre, seeded at Morris and Grand Rapids (1990-1992; 1994-1996). [1]

Note Key:

[1] Trials were established in 1993.

[2] Harvested three times in 1994.

[3] Harvested two times in 1994 due to slow establishment.

Variety	Morris [2]				Grand Rapids [3]		
	1990-92	1994	1995	1996	1994	1995	1996
Lara	—	—	—	—	—	—	—
Palaton	3.8	5.8	7.2	5.2	3.0	3.7	3.7
Rise	4.0	—	—	—	—	—	—
Vantage	4.0	5.7	7.1	4.4	2.7	3.8	3.4
Venture	4.3	5.6	6.7	4.1	2.7	4.0	3.7
LSD 0.05	NS	NS	0.5	1.0	NS	NS	NS

Table 1B. Dry matter yields of reed canarygrass varieties, tons per acre, seeded at Rosemount (1990-1992; 1994-1996). [1]

Note Key:

[1] Trials were established in 1993.

[2] Harvested two times in 1994 due to slow establishment.

Variety	1990-92	Rosemount [2]		1996
		1994	1995	
Lara	—	3.0	3.7	2.3
Palaton	6.9	3.2	3.8	2.4
Rise	6.2	—	—	—
Vantage	6.3	3.3	4.0	2.6
Venture	7.1	3.2	3.9	2.2
LSD 0.05	0.8	NS	NS	0.3

Table 2. Reed canarygrass seed sources for 1997 production. Alphabetical listing, with marketed variety noted with each entry.

Marketer	Variety
Agassiz Seed & Supply 445 7th St. NW ... West Fargo, ND 58078 ... 701-282-8118	<i>Palaton, Venture</i>
Brown Seed Farms N 1279 530th St. ... Bay City, WI 54723 ... 715-594-3003	<i>Palaton</i>
Croplan Genetics PO Box 64089, Cenex/Land O' Lakes ... St. Paul, MN 55164 ... 612-451-5490	<i>Palaton</i>
Kaltenberg Seed Farms Inc. 20155 Biscayne Ave. W ... Farmington, MN 55024 ... 612-463-8997 PO Box 278 ... Waunakee, WI 53597 ... 608-849-5021	<i>Venture</i>
Olds/Payco Seed Co. Box 7790 ... Madison, WI 53707 ... 800-356-7333	<i>Palaton, Venture</i>
Peterson Seed Co., Inc. Box 346 ... Savage, MN 55436 ... 612-445-2606	<i>Palaton, Venture</i>
Premium Seed Co., Inc. 7800 E State Hwy 101 ... Shakopee, MN 55379 ... 612-496-1783	<i>Palaton, Venture</i>
R.J. Hunt Seed Co. RR 1, Box 112 ... Wadena, MN 56482 ... 218-631-4190	<i>Palaton</i>
Werner Farm Seeds 3104 Millersburg Blvd. ... Dundas, MN 55019 ... 507-645-7995	<i>Palaton</i>

Reed Canarygrass Planting Rate and Date

Rate is based on normal seedbeds and on normal size, good quality seed. Rate used can vary greatly depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting and planting equipment. Weight given is the most widely accepted in the U.S.

Crop Use	Bushel Weight (pounds)	Seeds/pound (number)	Rate/acre (pounds)	Rate (seeds)	Planting Date
Alone	46	526,000	7	85/square foot	Early spring or summer
In Mixtures			5	60/square foot	

TALL FESCUE, WHEATGRASS VARIETY TRIALS

**Minnesota Agricultural Experiment Station — University of Minnesota
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Results of Tall Fescue Variety Tests Conducted by the Minnesota Agricultural Experiment Station. This report was prepared by Nancy J. Ehlke, agronomist, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108. [phone: 612/625-1791; e-mail: <ehlke001@maroon.tc.umn.edu>].

Crop Background

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. Tall fescue is subject to winter injury, but it may remain productive in areas with reliable snow cover.

Animal performance is better when the variety grown is endophyte-free. Endophytes are fungi that invade plant tissues, reducing forage palatability and animal performance.

The wheatgrasses are valuable, native forage species. They are especially suitable for growing in the northern Great Plains area of the United States. Wheatgrasses can produce excellent forage yields and sustained productivity under hay and pasture management systems either in monoculture or in mixtures with alfalfa or other suitable legumes. Recent releases of improved varieties have prompted interest in these species, especially in western areas of Minnesota.

Minnesota Agricultural Experiment Station scientists initiated performance trials of tall fescue and the wheatgrasses in 1992. The trials were harvested three times per year, and Nitrogen was applied in the early spring and after each harvest at rates of 40 to 50 pounds per acre.

Yields were high in 1993 and 1994 probably due to mild winters, and abundant rainfall and cool temperatures during the growing season. Severe winter injury in 1995 reduced

forage yields significantly at Rosemount. The wheatgrasses did yield less forage than the tall fescue varieties, however the wheatgrasses are better adapted to environments drier than the previous growing seasons.

Table 1. Maturity rating and dry matter yields, tons per acre, of tall fescue and wheatgrass varieties seeded at Rosemount (1993-1996). [1]

Note Key:

[1] Trials established in 1992 at Rosemount.

[2] Maturity rating scored on June 3, 1994 at Rosemount: 0=no panicle emergence, 9=complete panicle emergence.

[3] Endophytes: fungi that invade plant tissues. Reduces forage palatability, animal performance.

[4] Winter injury severe at Rosemount resulting in low yields and stand loss of Newhy.

Variety	Maturity [2]	1993	Yield 1994	1995 [4]
Tall Fescue				
Barcel	1	6.1	6.1	3.8
Fawn	8	5.2	5.5	3.9
Ky 31 - endophyte infected [3]	2	6.6	6.4	4.4
Ky 31 - endophyte-free	4	6.6	5.8	4.4
Martin	7	5.9	5.8	4.3
Mozark	7	6.2	5.7	4.2
Mustang	—	5.3	5.3	3.6
Stef	0	5.5	6.0	4.5
Wheatgrass				
Manska	0	4.2	4.0	3.7
Newhy	—	4.1	3.6	—
Reliant	0	4.5	4.1	3.9
LSD 0.05	1	0.8	0.6	0.6

Table 2. Dry matter yields, tons per acre, of tall fescue and wheatgrass varieties seeded at Grand Rapids and Morris (1993-1996). [1]

Note Key:

[1] Trials established in 1992 at Morris and 1993 at Grand Rapids.

[2] Endophytes: fungi that invade plant tissues, reducing forage palatability and animal performance.

Variety	Grand Rapids			1993	Morris		
	1994	1995	1996		1994	1995	1996
Tall Fescue							
Barcel	4.4	2.7	1.8	6.6	5.6	4.4	1.5
Fawn	4.2	3.2	2.4	7.7	5.5	4.8	1.8
Ky 31 - endophyte infected [2]	5.1	3.2	2.3	7.0	5.4	4.8	1.6
Ky 31 - endophyte-free	4.6	3.0	2.2	7.2	5.4	5.0	1.8
Martin	4.8	3.5	2.5	6.7	5.3	5.1	1.9
Mozark	4.8	3.4	2.4	6.8	5.8	4.9	1.7
Mustang	3.7	2.5	1.8	—	—	—	—
Stef	4.5	3.3	2.2	6.8	5.5	4.8	2.2
Wheatgrass							
Manska	3.4	3.1	2.2	5.6	6.0	5.0	2.7
Newhy	3.5	2.6	2.1	—	—	—	—
Reliant	3.5	3.1	2.4	5.6	6.1	5.4	2.7
LSD 0.05	0.6	0.5	0.3	0.7	NS	0.7	0.4

Table 3. Tall fescue seed sources for 1997 production. Alphabetical listing, with marketed variety noted with each entry.

Marketer	Variety
Kaltenberg Seed Farms Inc.	<i>Ky 31</i>
20155 Biscayne Ave. W ... Farmington, MN 55024 ... 612-463-8997	
PO Box 278 ... Waunakee, WI 53597 ... 608-849-5021	
Olds/Payco Seed Co.	<i>Fawn, Ky 31</i>
Box 7790 ... Madison, WI 53707 ... 800-356-7333	
Premium Seed Co., Inc.	<i>Barcel, Fawn, Ky 31</i>
7800 E State Hwy 101 ... Shakopee, MN 55379 ... 612-496-1783	
Twin Cities Seeds	<i>Martin</i>
7265 Washington Ave. S ... Edina, MN 55439 ... 612-944-7105	
Werner Farm Seeds	<i>Ky 31</i>
3104 Millersburg Blvd. ... Dundas, MN 55019 ... 507-645-7995	

Tall Fescue Planting Rate and Date

Rate is based on normal seedbeds and on normal size, good quality seed. Rate used can vary greatly depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting and planting equipment. Weight given is the most widely accepted in the U.S.

Crop Use	Bushel Weight (pounds)	Seeds/pound (number)	Rate/acre (pounds)	Rate (seeds)	Planting Date
In Mixtures	25	229,000	4	21/square foot	Early spring or summer

TIMOTHY VARIETY TRIALS

**Minnesota Agricultural Experiment Station — University of Minnesota
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Results of Timothy Variety Tests Conducted by the Minnesota Agricultural Experiment Station. This report was prepared by Nancy J. Ehlke, agronomist, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108. [phone: 612/625-1791; e-mail: <ehlke001@maroon.tc.umn.edu>].

Crop Background

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 yield and quality. Harvesting timothy at early heading is the preferred time. Timothy produces the majority of its forage at the first harvest.

Varieties of timothy differ in maturity so care should be taken in choosing ones that fit the management requirements of the 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 experiment station timothy trials were established in pure stands in 1992 at Rosemount and Morris and again at Grand Rapids in 1993. Nitrogen was applied at all locations in the early spring and after each harvest at a rate of 40 to 50 pounds per acre.

Early maturing varieties of timothy had greater forage production than the late maturing varieties at all locations over all harvest years. At Morris and Rosemount, the yields of timothy were exceptionally high in 1993 and 1994. These results may be partially attributed to mild winters, and abundant rainfall and cool temperatures during the growing seasons. Timothy is normally less persistent than other cool-season grasses such as reed canarygrass.

Table 1A. Dry matter yields, in tons per acre, of timothy varieties seeded at Grand Rapids and Rosemount (1993-1996). [1]

Note Key:

[1] Trials established in 1992 at Rosemount, and in 1993 at Grand Rapids.

[2] One harvest at Rosemount in 1995.

Variety	Grand Rapids			Rosemount		
	1994	1995	1996	1993	1994	1995 [2]
Early - Intermediate Maturity						
Climax	3.8	3.9	3.1	4.8	4.7	1.9
Comtal	3.9	3.6	2.7	4.6	5.1	1.5
Goliath	3.8	3.7	2.8	4.3	4.5	1.5
Timfor	4.0	3.6	2.8	4.5	4.8	2.0
Toro	4.2	3.9	3.0	4.8	5.0	2.0
Late Maturity						
Heidemij	3.7	3.8	2.9	4.1	3.6	1.3
Hokusen	3.6	3.5	2.7	4.0	4.4	1.8
LSD 0.05	0.6	0.3	0.3	0.6	0.4	0.4

Table 1B. Dry matter yields, in tons per acre, of timothy varieties seeded at Morris (1993-1996), and the mean for yields at three locations (Grand Rapids, Morris and Rosemount). [1]

Note Key:

[1] Trials established in 1992 at Morris.

[2] Mean excludes Rosemount, 1995 data.

Variety	Morris				Mean [2]
	1993	1994	1995	1996	
Early - Intermediate Maturity					
Climax	5.5	4.0	4.0	2.5	4.3
Comtal	—	—	—	—	4.0
Goliath	—	—	—	—	3.8
Timfor	—	—	—	—	4.0
Toro	—	—	—	—	4.2
Late Maturity					
Heidemij	4.1	3.9	3.7	2.2	3.5
Hokusen	4.7	3.7	3.6	2.2	3.6
LSD 0.05	0.5	NS	NS	NS	

Table 2. Timothy seed sources for 1997 production. Alphabetical listing, with marketed variety noted with each entry.

Marketer	Variety
Agassiz Seed & Supply 445 7th St. NW ... West Fargo, ND 58078 ... 701-282-8118	<i>Climax</i>
Discount Farm Center PO Box 84, West Hwy 212 ... Watertown, SD 57201 ... 605-886-5888	<i>Climax</i>
Kaltenberg Seed Farms Inc. 20155 Biscayne Ave. W ... Farmington, MN 55024 ... 612-463-8997 PO Box 278 ... Waunakee, WI 53597 ... 608-849-5021	<i>Climax</i>
La Crosse Seed Corp. PO Box 187 ... La Crosse, WI 54601 ... 608-781-4848	<i>Climax</i>
Northrup King Co. PO Box 959 ... Minneapolis, MN 55440 ... 612-593-7261	<i>Climax</i>
Olds/Payco Seed Co. Box 7790 ... Madison, WI 53707 ... 800-356-7333	<i>Climax, Comtal</i>
Peterson Seed Co., Inc. Box 346 ... Savage, MN 55436 ... 612-445-2606	<i>Climax</i>
Premium Seed Co., Inc. 7800 E State Hwy 101 ... Shakopee, MN 55379 ... 612-496-1783	<i>Climax</i>
R.J. Hunt Seed Co. RR 1, Box 112 ... Wadena, MN 56482 ... 218-631-4190	<i>Climax</i>
Seed Mart, Inc. PO Box 126, 925 Dexter St. ... Prescott, WI 54021 ... 715-262-4430	<i>Climax</i>
Top Farm Hybrids 17177 60th St. SW ... Cokato, MN 55321 ... 320-286-5516	<i>Climax</i>
Werner Farm Seeds 3104 Millersburg Blvd. ... Dundas, MN 55019 ... 507-645-7995	<i>Climax</i>

Timothy Planting Rate and Date

Rate is based on normal seedbeds and on normal size, good quality seed. Rate used can vary greatly depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting and planting equipment. Weight given is the most widely accepted in the U.S.

Crop Use	Bushel Weight (pounds)	Seeds/pound (number)	Rate/acre (pounds)	Rate (seeds)	Planting Date
In Mixtures	45	1,234,000	3	85/square foot	Early spring or summer

BARLEY VARIETY TRIALS

**Minnesota Agricultural Experiment Station — University of Minnesota
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Results of Barley Variety Tests Conducted by the Minnesota Agricultural Experiment Station. This report was prepared by Donald Rasmusson, agronomist, and Edward Schiefelbein, scientist, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108. [phone: 612/625-7278; e-mail: <rasmu002@maroon.tc.umn.edu>].

Fusarium Head Blight

Fusarium head blight (scab) again caused serious losses in barley via reductions in yield and quality, and the production of vomitoxin. Until it reemerged and attacked Minnesota's barley crop in 1993, scab had not been a significant problem on barley since the 1940s. Currently recommended varieties appear to be equally susceptible to scab.

Classification Changes

Foster, a North Dakota developed barley, was added to the recommended list this year. It was recently classified as a malting variety by the American Malting Barley Association (AMBA). Excel was recently dropped from the list of varieties recommended by the University. Royal continues to be recommended as a forage companion crop and feed-grain variety.

Recommended Public Varieties

Foster--Medium yield. Maturity similar to Robust. Kernel plumpness good, similar to Stander. Intermediate in lodging reaction between Robust and Stander. Resistant to spot blotch. Six-rowed, semi-smooth awns, colorless aleurone. Has long rachilla hairs allowing grain to be distinguished from that of Robust and Stander. Classified as a malting variety by AMBA. Developed by North Dakota Agricultural Experiment Station from a cross involving Robust, ND 5570, Glenn and Karl. Released 1995. Seed sales regulated by the U.S. Plant Variety Protection Act, PVP(94).

Robust--Medium yield and medium 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 Agricultur-

al Experiment Station from cross of Morex and Manker. Released 1983. Seed sale regulated by U.S. Plant Variety Protection Act.

Stander--High yield. Superior in lodging resistance to Robust and Foster. Good kernel plumpness, similar to Foster. 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 crosses involving Excel, Robust and Bumper. Released 1993. Seed sale regulated by U.S. Plant Variety Protection Act.

Special Purpose Variety

Royal--Intended for use as a forage-companion crop and feed-grain variety. Not a malting type. Six-rowed, semi-smooth awn, blue aleurone, semidwarf stature. Forage quality superior to taller varieties based on digestibility and intake potential; low in fiber and lignin. Similar to Robust in forage protein and forage yield at the soft dough stage. Compared to taller barley and oat varieties, it competes less with underseeded forage legumes because of its short stature and superior lodging resistance. Resistant to spot blotch. Developed by the Minnesota Agricultural Experiment Station from crosses involving Robust, Azure and semidwarf Minn. M32. Released 1994. Seed sale regulated by U.S. Plant Variety Protection Act.

Other Varieties

Azure--Medium yield. Medium maturity. Six-rowed, semi-smooth awn, long rachilla hairs, blue aleurone. Classified as a malting variety by AMBA. Resistant to spot blotch. Grain yield similar to Robust in Minnesota trials, but is not recommended because of limited Minnesota demand for a blue aleurone malting variety. Developed by North Dakota Agricultural Experiment Station from a cross involving Bonanza, Nordic, and ND B130. Released 1982.

Bowman--Medium yield. Medium maturity. Very good kernel plumpness. Medium lodging resistance. Two-rowed, smooth awns, long rachilla hairs, 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.

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

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

Table 1. Grain yield of selected barley varieties in bushels per acre, 1992-1996.

Note Key:

Locations: Cr=Crookston, Mor=Morris, Stn=Stephen, StP=St. Paul, Rou=Roseau, AVG=average for all five locations.

Variety	Cr	Mor	Stn	StP	Rou	AVG
Number of Trials	8	4	1	3	1	17
Robust	92	90	108	86	99	92
Excel	106	100	112	96	124	104
Stander	107	103	112	102	111	106
Foster	99	90	105	97	107	97
LSD 0.05	4	3	14	2	15	3

Table 2. Agronomic traits of selected barley varieties, 1992-1996.

Note Key:

[1] Heading expressed as date in June.

[2] Height expressed in centimeters.

[3] Lodging expressed as a percentage representing the extent to which plants fall over in a test plot: 0=no plants down, 100=all plants down.

[4] Plump Kernals expressed as the percentage of kernals which remain on the top of a sieve representing industry standard of desirability.

Variety	Heading [1]	Height [2]	Lodging [3]	Plump Kernals [4]
Number of Trials	11	16	6	10
Robust	22	83	34	82
Excel	22	75	35	76
Stander	23	73	26	89
Foster	22	76	36	88

Barley Planting Rate and Date

Rate is based on normal seedbeds and on normal size, good quality seed. Rate used can vary greatly depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting and planting equipment. Weight given is the most widely accepted in the U.S.

Bushel Weight (pounds)	Seeds/pound (number)	Rate/acre (pounds)	Rate (seeds)	Planting Date
48	14,300	85	28/square foot	Early spring

OAT VARIETY TRIALS

**Minnesota Agricultural Experiment Station — University of Minnesota
December 1996**

Results of Oat Variety Tests Conducted by the Minnesota Agricultural Experiment Station. This report was prepared by Deon D. Stuthman, agronomist, University of Minnesota, St. Paul, MN 55108. [phone: 612/625-3709; e-mail: <stuth001@maroon.tc.umn.edu>]

Crown Rust Caution

Crown rust infection has dramatically increased in Minnesota oat fields since 1990, and at least five new races have been identified in recent years. As a result, varieties previously reported to have good crown rust resistance are now known to be vulnerable. Varieties with limited or no rust resistance should be grown with caution.

Recommended Varieties

Dane—Early maturity, high yield, short, good lodging resistance, fair test weight, high groat percentage, yellow seed. Moderately resistant to crown rust and smut, 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. Seed sale regulated by U.S. Plant Variety Protection Act.

Jim—Early maturity, high yield, short, good lodging resistance, high test weight and groat percentage, yellow seed. Small resistance to crown rust, resistant to smut, good tolerance to red leaf. Selected at Minnesota Agricultural Experiment Station. Released 1996. Application for Plant Variety Protection Certificate has been submitted.

Milton—Medium-late maturity, very high yield, medium height, good lodging resistance, medium test weight and groat percentage, yellow seed. Small resistance to crown rust, resistant to smut, susceptible to red leaf. Selected at the Minnesota Agricultural Experiment Station. Released 1994. Application for Plant Variety Protection Certificate has been submitted.

Jerry—Medium maturity, very high yield, tall, good lodging resistance, very high test weight, high groat percentage, ivory seed. Moderately resistant to crown rust, susceptible to smut, tolerant to red leaf. Selected at North Dakota Agricultural Experiment Station. Released 1994. Seed sales regulated by the U.S. Plant Variety Protection Act, PVP(94). *Because of smut susceptibility, planting only treated seed is recommended.*

Special Purpose Varieties

Pal—Forage establishment only. Medium-late maturity, low grain yield, very short, good lodging resistance, low test weight, medium groat percentage, yellow seed. Moderately resistant to crown rust, susceptible to red leaf, resistant to smut. Selected at the Minnesota Agricultural Experiment Station and released in 1994 as a special purpose forage oat variety. It has good forage yield with high levels of crude protein and good relative feed value, although no forage data for Pal is provided in this publication.

Paul—Hulless. Medium-late maturity, high yield for hulless cultivar, tall, very good lodging resistance, hulless so very high test weight. Resistant to crown rust, smut, and moderately susceptible to red leaf. Selected at North Dakota Agricultural Experiment Station. Released 1994. Seed sales regulated by the U.S. Plant Variety Protection Act, PVP(94).

Varieties Not Adequately Tested

Gem—Medium-late maturity, very high yield, medium height, good lodging resistance, high test weight and groat percentage, yellow seed. Resistant to crown rust and smut, good tolerance to red leaf. Selected at Wisconsin Agricultural Experiment Station. Released 1995. Foundation Seed available to Certified Seed producers only under a license/fee collection agreement. Application for Plant Variety Protection Certificate has been submitted.

Belle—Late maturity, medium yield, tall, very good lodging resistance, very high test weight and groat percentage, yellow seed. Resistant to crown rust and smut, susceptible to red leaf. Selected at the Wisconsin Agricultural Experiment Station. Released 1995. Foundation Seed available to Certified Seed producers only under a license/fee collection agreement. Application for Plant Variety Protection Certificate has been submitted.

Whitestone—Late maturity, medium yield, medium height, fair lodging resistance, high test weight and groat percentage, white seed. Resistant to crown rust and smut, some tolerance to red leaf. Selected at North Dakota Agricultural Experiment Station. Released 1994. Application for Plant Variety Protection Certificate has been submitted. *Because of smut susceptibility, planting only treated seed is recommended.*

Other Varieties

Armor—Early-medium maturity, poor yield, medium height, fair lodging resistance, poor test weight and groat percentage, yellow seed. Susceptible to crown rust, resistant to smut, tolerant to red leaf. Selected at the Ohio Agricultural Experiment Station. Released 1992.

Bay—Late maturity, medium yield, short, very good lodging resistance, poor test weight, fair groat percentage, ivory seed. Moderately susceptible to crown rust and smut, tolerant to red leaf. Selected at the Wisconsin Agricultural Experiment Station. Released in 1993. Foundation Seed available to Certified Seed producers only under a license/fee collection agreement. Application for Plant Variety Protection Certificate has been submitted.

Brawn—Medium maturity, medium yield and height, good lodging resistance, poor test weight, fair groat percentage, dark ivory seed. Susceptible to crown rust, some resistance

to smut and little tolerance to red leaf. Selected at the Illinois Agricultural Experiment Station. Released 1993.

Classic—Medium maturity, high yield, medium height, very good lodging resistance, medium test weight and groat percentage, yellow seed, moderately susceptible to crown rust, good resistance to smut, very tolerant to red leaf. Selected at the Purdue Agricultural Experiment Station. Released 1995. 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, medium yield, short, fair lodging resistance, medium test weight and groat percentage, low protein percentage, white seed. Susceptible to crown rust and red leaf, some resistance to smut. Selected at the Illinois Agricultural Experiment Station. Released 1985.

Hazel—Medium maturity and yield, short, good lodging resistance, high test weight, very high groat percentage, medium protein percentage, ivory seed. Susceptible to crown rust and 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.*

INO 9201—Early maturity, high yield, short, good lodging resistance, medium test weight and groat percentage, yellow seed. Moderately susceptible to crown rust, tolerant to red leaf, susceptible to smut. Selected at the Purdue Agricultural Experiment Station. Released 1994. 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.*

INO 9212—Medium maturity and yield, short, good lodging resistance, medium test weight, fair groat percentage, yellow seed. Susceptible to crown rust, smut and red leaf. 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.*

Premier—Medium maturity, yield and height, good lodging resistance, medium test weight, groat percentage and protein percentage, 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. Seed sale regulated by U.S. Plant Variety Protection Act.

Prairie—Medium-late maturity, medium yield and height, fair lodging resistance, medium test weight and groat percentage, white seed. Susceptible to crown rust and 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. Seed sale also regulated by U.S. Plant Variety Protection Act. *Because of smut susceptibility, planting only treated seed is recommended.*

Starter—Early maturity, medium yield, short, fair lodging resistance, medium test weight and groat percentage, medium protein percentage, yellow seed. Susceptible to crown rust

and red leaf, resistant to smut. Selected at the Minnesota Agricultural Experiment Station from a cross of Noble and a Pal derivative. Released 1986. Seed sale regulated by U.S. Plant Variety Protection Act. *Well suited for companion cropping.*

Troy—Medium maturity, high yield, tall, poor lodging resistance, low test weight, medium groat percentage, white seed. Moderately susceptible to crown rust, resistant to smut and good tolerance to red leaf. Selected at the South Dakota Agricultural Experiment Station. Released 1991.

Valley—Late maturity, medium yield, short, fair lodging resistance, medium test weight and groat percentage, medium protein percentage, ivory seed. Susceptible to crown rust and smut, some tolerance to red leaf. Selected at the North Dakota Agricultural Experiment Station. Released 1988. *Because of smut susceptibility, planting only treated seed is recommended.*

Table 1A. Oat yield by experiment station location (1994-1996), measured in bushels per acre. Sorted by days to heading, to match order in Table 1B.

Note Key:

[1] 1996 only, adjusted.

[2] 1995-1996 only; adjusted.

[3] Yields of hulless varieties should be adjusted upward by about one-third when comparing to seed yield of standard varieties.

Locations: Ros=Rosemount, Was=Waseca, Lam=Lamberton, Mor=Morris, Cr=Crookston, GRap=Grand Rapids, AVG=average for all six locations.

Variety	Ros	Was	Lam	Mor	Cr	GRap	AVG
Dane	81.9	59.7	57.3	88.5	89.5	98.5	79.2
INO 9201	78.7	76.2	56.4	87.3	103.7	88.2	81.8
Jim	79.5	61.9	44.4	79.7	112.1	88.8	77.8
Jerry	95.4	81.9	69.6	88.2	93.8	101.1	88.4
Troy	83.2	70.3	58.7	78.8	123.7	84.9	83.3
Pal	59.4	61.4	59.4	58.3	86.6	68.6	64.8
Classic	93.8	83.7	69.6	72.9	89.0	86.9	82.7
Milton	86.6	78.0	64.1	92.0	124.4	108.0	92.2
Gem [1]	87.8	78.6	75.2	103.9	111.8	95.8	92.2
Paul (hulless) [3]	49.3	46.6	54.2	75.2	81.5	74.4	63.5
Belle [2]	85.2	75.7	61.0	96.4	101.3	82.7	83.7
Whitestone [2]	82.8	72.2	62.8	68.4	93.3	103.9	80.6
LSD 5%	9.0	7.7	7.4	10.4	9.6	11.0	3.8

Table 1B. Characteristics of oat varieties, 1996. Sorted by days to heading.

Note Key:

[1] Heading, expressed as days after planting.

[2] Height expressed in inches.

[3] Lodging score: 1 = erect, 5 = flat.

[4] Test weight, measured in pounds per bushel.

[5] CR=Crown Rust. Rating: IR = intermediate resistant, IS = intermediate susceptible, R = resistant, S = susceptible.

[6] BYDV ("red leaf") rating: 1 = no symptoms, 9 = dead.

NA = Not applicable.

Variety	Heading [1]	Height [2]	Lodging [3]	Weight [4]	Groat %	Reaction to Disease		
						CR [5]	Smut %	BYDV [6]
Dane	52	31	2.1	34	72.6	IR	1	8
INO 9201	54	31	2.1	36	70.7	IS	30	4
Jim	55	32	2.1	37	73.3	IS	0	4
Jerry	60	37	2.3	39	71.7	R	40	4
Troy	60	39	3.4	33	68.4	S	0	3
Classic	60	34	1.8	36	68.5	IR	10	2
Pal	61	27	2.0	33	67.8	IR	1	6
Milton	61	34	2.2	35	70.9	IS	5	7
Gem	61	36	2.3	38	73.3	R	5	4
Paul (hulless)	62	40	1.9	NA	NA	R	0	6
Belle	63	38	1.8	38	74.8	R	5	7
Whitestone	65	35	2.7	38	72.0	R	5	5

Table 2. Oat yield, off-station locations, measured in bushels per acre, 1996. Sorted by days to heading, to match order in Table 1B.

Note Key:

[1] No pesticides.

[2] Certified organic.

[3] No-till.

Locations: Rou=Roseau, Stn=Stephen, Win=Winona, Wells=Wells, Mad=Madison, AVG=average for all five locations.

Variety	Rou	Stn	Win [1]	Wells [2]	Mad [3]	AVG
Dane	99.8	48.2	25.0	60.0	74.0	61.4
INO 9201	93.9	57.9	38.0	43.0	97.0	66.0
Jim	98.4	56.2	31.0	40.0	89.0	62.9
Jerry	106.2	67.1	48.0	30.0	95.0	69.3
Troy	97.1	72.2	18.0	38.0	59.0	56.9
Pal	81.4	55.9	38.0	46.0	64.0	57.1
Classic	88.5	60.9	26.0	42.0	96.0	62.7
Milton	112.7	68.4	39.0	45.0	74.0	67.8
Gem	110.3	73.4	31.0	87.0	108.0	81.9
Paul (hulless)	81.6	55.9	58.0	60.0	66.0	64.3
Belle	116.3	66.4	44.0	77.0	121.0	84.9
Whitestone	112.9	76.0	50.0	69.0	117.0	85.0
LSD 5%	11.0	14.2	16.0	21.5	17.5	7.3

Oat Planting Rate and Date

Rate is based on normal seedbeds and on normal size, good quality seed. Rate used can vary greatly depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting and planting equipment. Weight given is the most widely accepted in the U.S.

Bushel Weight (pounds)	Seeds/pound (number)	Rate/acre (pounds)	Rate (seeds)	Planting Date
32	16,200	80	28/square foot	Early spring

For Crop Production 1997 _____

HARD RED SPRING WHEAT VARIETY TRIALS

**Minnesota Agricultural Experiment Station — University of Minnesota
December 1996**

Results of Hard Red Spring Wheat Variety Tests Conducted by the Minnesota Agricultural Experiment Station. This report was prepared by Robert H. Busch, agronomist, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108. [phone: 612/625-1975; e-mail: <busch005@maroon.tc.umn.edu>].

Crop Background

Recommendations for hard red spring wheat varieties are no longer being made by Minnesota Agricultural Experiment Station evaluators. The basis on which recommendations were made in the past are no longer considered appropriate because of the severity of scab epidemics.

Scab epidemics in hard red spring wheat growing areas have demonstrated the clear need to give greater weight to selecting varieties for their tolerance to this devastating disease. Consequently, only newly released varieties where reaction to scab has not been well documented, and older varieties with scab ratings better than susceptible, are tested and described. Scab evaluations provide *severity ratings*, based on visual spread of the disease on the spike, and *tolerance scores*, which reflect the variety's ability to maintain plump seed. These ratings should be considered together to reduce risk of loss. Use of more than one variety is also highly recommended to reduce risk.

Variety descriptions do not provide information on scab resistance. Table information should be used. Varieties are listed in maturity order.

Publicly Developed Varieties

BacUp—Awned, very early, normal height. Leaf and stem rust resistant. Low to medium yield and very high test weight. Moderately susceptible to foliar disease complex and lodging. High tolerance to scab. Very high protein content. Specialty variety release for scab tolerance with recommendation that it not be used on over 15-20% of acreage. Released by USDA-ARS and Minnesota Agricultural Experiment Station in 1996.

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

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

Kulm—Awned, early, medium height. Moderately resistant to leaf rust and resistant to stem rust. High yield and test weight. High protein percentage. Moderately susceptible to lodging. Released by North Dakota Agricultural Experiment Station in 1994. Seed sales regulated by the U.S. Plant Variety Protection Act, PVP(94).

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

Russ—Awned, early-midseason maturity, medium height. Moderately resistant to stem rust and leaf rust. High yield and medium test weight. Moderately susceptible to lodging. Medium protein percent. Moderately susceptible to foliar diseases. Released by South Dakota Agricultural Experiment Station in 1995.

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

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

Verde—Awned, midseason-late maturity, semidwarf. Resistant to stem rust and moderately resistant to leaf rust. High yield and medium test weight. Good lodging resistance. Medium to low protein percent. Moderately resistant to foliar diseases. Released by Minnesota Agricultural Experiment Station and USDA-ARS 1995. Seed sale regulated by the U.S. Plant Variety Protection Act, PVP(94).

Trenton—Awned, early, medium height. Resistant to stem rust and moderately resistant to leaf rust. High yield and medium test weight. Moderately susceptible to lodging. Medium-high protein percent. Moderately susceptible to foliar diseases. Recommended by North Dakota State University for western and central North Dakota. Released by North

Dakota Agricultural Experiment Station in 1995. Seed sale regulated by the U.S. Plant Variety Protection Act, PVP(94).

Privately Developed Varieties

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

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 in 1989. Sold by North Dakota State University Research Foundation in 1990. Seed sale regulated by U.S. Plant Variety Protection Act.

Sharpshooter—Awned, early, normal height. Leaf and stem rust resistant. Medium to high yield and high test weight. Moderately susceptible to foliar disease complex and lodging. Similar to Sharp, selected from for possibly enhanced scab tolerance. Released by Western Plant Breeders in 1996. Seed sale regulated by U.S. Plant Variety Protection Act.

Hamer—Awned, early-midseason maturity, semidwarf. Resistant to stem rust and moderately resistant to leaf rust. High yield and medium test weight. Good lodging resistance. Medium to low protein percent. Moderately resistant to foliar diseases. Released by AgriPro 1995. Seed sale regulated by the U.S. Plant Variety Protection Act, PVP(94).

Lars—Awned, midseason, semidwarf. Resistant to stem rust and moderately resistant to leaf rust. High yield and low test weight. Good lodging resistance. Low-medium protein percent. Moderately resistant to foliar diseases. Released by AgriPro in 1995. Seed sale regulated by the U.S. Plant Variety Protection Act, PVP(94).

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

Norlander—Awned, early, semidwarf. Moderately susceptible to stem rust and moderately resistant to leaf rust. High yield and medium test weight. Good lodging resistance. Medium protein percent. Moderately resistant to foliar diseases. Released by AgriPro 1995. Seed sale regulated by the 1995 U.S. Plant Variety Protection Act.

Gunner—Awned, late, normal height. Leaf rust resistant and moderately resistant to stem rust. Medium yield and high test weight. Moderately susceptible to foliar disease complex and lodging. Tolerance to scab. High protein content. Released by AgriPro in 1996.

Table 1. Growth and yield characteristics of hard red spring wheat varieties (1994-96; only new varieties and older varieties with scab ratings better than susceptible are included in trials). Sorted by heading date.

Note Key:

[1] Heading date.

[2] Height expressed in inches.

[3] Lodging score: 1=erect, 9=flat.

[4] Test weight expressed as pounds per bushel.

[5] Protein expressed as a percentage, calculated at 12% moisture.

[6] Two year data adjusted to 1994-96.

[7] Norm is included as a scab susceptible check.

Variety	Heading [1]	Height [2]	Lodging [3]	Test Weight [4]	Wheat Protein [5]	Milling/Baking Quality
Bacup [6]	6-26	32	3.0	60.0	17.3	High
Sharp	6-27	32	2.9	59.7	15.4	Medium-High
Kulm	6-27	33	2.8	58.7	15.8	High-Medium
Norlander	6-27	31	2.3	57.3	14.9	Medium
Butte 86	6-27	33	2.7	58.3	15.5	Medium-High
2375	6-28	31	3.7	58.8	15.3	Medium
Russ	6-28	32	3.2	57.7	15.1	Medium
Oxen	6-28	30	2.8	57.9	15.2	Medium
2370	6-29	32	2.3	57.8	15.1	Medium
Grandin	6-29	32	2.4	58.6	15.4	High
Hamer	6-29	30	1.9	57.7	15.1	Medium-Low
Trenton	6-29	36	2.9	58.4	15.8	High-Medium
Lars	6-30	28	2.1	56.5	14.2	Medium-Low
Stoa	6-30	35	3.2	56.2	15.1	Medium-High
Norm [7]	6-30	31	2.3	56.2	14.1	Medium-High
Verde	7-1	30	2.1	57.4	14.3	Medium
Nordic	7-2	31	2.4	56.9	13.7	Low
Marshall	7-2	30	1.8	57.5	14.1	Medium-Low
AC Cora [6]	7-3	35	2.6	57.2	16.2	High-Medium

Table 2. Disease susceptibility and tolerances of hard red spring wheat varieties ((1994-96; only new varieties and older varieties with scab ratings better than susceptible are included in trials). Sorted by heading date). Sorted by heading date to match order in Table 1.

Note Key:

[1] Resistance to rust: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible.

[2] Rated based on NDSU data from 1994-96.

[3] Tolerance to maintain plump kernels under scab epidemics: 1=very well, 2=well, 3=moderate, 4=fair, 5=poor.

[4] Two year data adjusted to 1994-96.

[5] Norm is included as a scab susceptible check.

Variety	Leaf Rust [1]	Stem Rust [1]	Foliar Disease [1] [2]	Scab Severity [3]	Scab Tolerance [3]
Bacup [4]	R	R	MS	MR	1
Sharp	MR	R	MS	MR-MS	2.5
Kulm	MR	R	S	MS	3
Norlander	MR	MS	MS	MS-MR	4
Butte 86	MR	R	S	MR-MS	3
2375	MR	R	S	MR-MS	2
Russ	MR	MR	S	MS	3
Oxen	MR	MR	—	MR-MS	3
2370	MR	MR	S	MS-S	3.5
Grandin	R	R	S	MS-S	3
Hamer	R	R	MR	MS	3.5
Trenton	MS	MR	MR	MS	2
Lars	R	R	MR	S	5
Stoa	R	R	S	MS	3
Norm [5]	R	R	MR	S	5
Verde	MR	R	MR	MS	3
Nordic	R	R	MR	MS	3.5
Marshall	MR	R	MS	MS	3
AC Cora [4]	MR	R	MR	MS-S	3

Table 3. Yields, in bushels per acre, of hard red spring wheat varieties in Minnesota (1994-96; only new varieties and older varieties with scab ratings better than susceptible are included in trials). Sorted by heading date to match order in Table 1.

Note Key:

[1] 2-year average 1994 and 1996.

[2] 2-year average 1995-96.

[3] 2-year average 1994-95.

[4] Norm is included as a scab susceptible check.

Locations: Cr=Crookston; Stn=Stephen; Rou=Roseau; StP=Saint Paul; Mor-Morris; Was=Waseca; N.AVG=average for three northern sites (Crookston, Stephen and Roseau); S.AVG=average for three southern sites (Saint Paul, Morris and Waseca); AVG=average for all six sites.

Variety	Cr	Stn [1]	Rou [2]	N.AVG	StP	Mor [3]	Was [2]	S.AVG	AVG
BacUp [2]	39	38	43	40	45	50	49	48	44
Sharp	50	42	42	48	53	62	59	59	54
Kulm	48	39	39	48	50	67	59	59	54
Norlander	50	47	47	51	65	58	54	62	57
Butte 86	47	34	34	46	54	62	59	58	52
2375	48	46	46	50	54	66	61	61	56
Russ	47	38	38	46	55	66	64	63	55
Oxen	50	46	46	50	63	67	61	65	58
2370	51	41	41	50	59	64	54	62	56
Grandin	48	37	37	46	58	56	56	59	53
Hamer	50	40	40	49	60	72	62	64	57
Trenton	45	35	35	44	47	61	62	58	52
Lars	55	45	45	52	61	67	60	63	58
Stoa	47	42	42	48	49	55	59	57	53
Norm [4]	39	29	30	39	62	58	63	62	52
Verde	50	44	44	51	65	62	56	63	57
Nordic	47	42	42	48	57	51	62	58	54
Marshall	49	41	41	46	59	56	55	59	53
AC Cora [2]	47	42	47	45	47	54	47	49	45
LSD 0.05	8	10	10	5	7	11	12	6	4

Hard Red Spring Wheat Planting Rate and Date

Rate is based on normal seedbeds and on normal size, good quality seed. Rate used can vary greatly depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting and planting equipment. Weight given is the most widely accepted in the U.S.

Bushel Weight (pounds)	Seeds/pound (number)	Rate/acre (pounds)	Rate (seeds)	Planting Date
60	15,200	80	28/square foot	Early Spring

WINTER WHEAT VARIETY TRIALS

**Minnesota Agricultural Experiment Station — University of Minnesota
December 1996**

Results of Winter Wheat Variety Tests Conducted by the Minnesota Agricultural Experiment Station. This report was prepared by Robert H. Busch, agronomist, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108. [phone: 612/625-1975; e-mail: <busch005@maroon.tc.umn.edu>].

Crop Background

Varieties are listed in maturity order. A minimum of two years testing is required before any data will be presented. 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.

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. Satisfactory quality. Released by Nebraska Agricultural Experiment Station and USDA-ARS 1988. Seed sale regulated by U.S. Plant 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.

Elkhorn—Awned, tall, medium-late, and fair lodging resistance. Winter-hardy to very winter-hardy. Moderately susceptible to leaf rust and resistant to stem rust. High yield and test weight. Medium protein percent. Satisfactory quality. Released by the North Dakota Agricultural Experiment Station 1995.

Rose—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.

Table 1. Growth characteristics of publicly developed winter wheat varieties (1994-96).

Note Key:

[1] Heading date. Data does not include Roseau.

[2] Height expressed in inches.

[3] Winter survival rating: VH=very hardy, H=hardy, MH=moderately hardy, NH=not hardy.

[4] Lodging score: 1=erect, 9=flat.

[5] Resistance to rust: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible.

Variety	Heading [1]	Height [2]	Hardiness [3]	Lodging [4]	Leaf Rust Reaction [5]	Stem Rust Reaction [5]
Arapahoe	6-10	40	H	1.3	R	R
Roughrider	6-13	42	VH	2.6	S	MR
Seward	6-14	42	VH	1.9	MR	R
Rose	6-11	40	H	2.1	MS	MR
Elkhorn	6-14	42	VH	2.0	MS	R

Table 2. Yield, in bushels per acre, and yield characteristics of publicly developed winter wheat varieties (1994-96).

Note Key:

[1] Test weight expressed as pounds per bushel; 1994 and 1995 data.

[2] Protein expressed as a percentage, calculated at 12% moisture.

[3] 1994 data only.

Locations: Ros=Rosemount; Mor=Morris; Rou=Roseau; AVG=average for all three sites.

Variety	Test Weight [1]	Protein [2]	Yield			
			Ros	Mor	Rou [3]	AVG
Arapahoe	58.6	12.7	69	62	57	64
Roughrider	59.7	13.3	54	56	49	54
Seward	59.0	11.5	70	64	59	66
Rose	60.2	12.5	55	58	48	55
Elkhorn	58.8	12.8	63	61	—	61
LSD 0.05			8	NS	7	6

Winter Wheat Planting Rate and Date

Rate is based on normal seedbeds and on normal size, good quality seed. Rate used can vary greatly depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting and planting equipment. Weight given is the most widely accepted in the U.S.

Bushel Weight (pounds)	Seeds/pound (number)	Rate/acre (pounds)	Rate (seeds)	Planting Date
60	14,500	75	25/square foot	August 20 to September 20

For Crop Production 1997 _____

CANOLA VARIETY TRIALS

**Minnesota Agricultural Experiment Station — University of Minnesota
December 1996**

Results of Public and Private Canola Tests Conducted by the Minnesota Agricultural Experiment Station. This report was prepared by Ervin A. Oelke, extension agronomist, and David G. LeGare, associate scientist, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108. [phone: 612/625-1211; e-mail: <oelke002@maroon.tc.umn.edu>].

Spring Canola Variety Trials

Canola (*Brassica napus* or *B. rapa*) is used for edible oil extraction and protein feed meal. Canola oil is considered one of the highest quality edible oils available. Considerable acreage of spring canola is grown in Canada. Interest in spring canola has increased recently in Minnesota. In 1990 there were about 8,000 acres grown in Minnesota while acreage planted to canola grew to about 70,000 acres by 1996.

Canola is a crop developed from oilseed rape by Canadian plant breeders. The first canola variety was licensed in 1974.

The oil in canola seed contains less than 2 percent erucic acid. This compares with the 20 to 40 percent level of erucic acid found in oilseed rape. The meal remaining after oil extraction contains less than 0.1 percent of glucosinolate (sulfur containing compounds) compared with about 1 percent in rapeseed meal. High levels of erucic acid in food oils are hazardous to health, and high levels of glucosinolates are detrimental in livestock feeds. Therefore, canola is also referred to as "double low" or "00" rapeseed.

The canola varieties described here are spring-sown types. Winter canola varieties were previously evaluated by University of Minnesota researchers at locations throughout the state. In trials over 15 year/locations, less than 30 percent of the trials successfully overwintered, making current varieties too risky for Minnesota's growing conditions.

Production information is provided in the canola chapter of the *Alternative Field Crops Manual*. The cost of the manual is \$45. Contact your county extension educator or the Center for Alternative Plant & Animal Products, 352 Alderman Hall, Univer-

sity of Minnesota, St. Paul, MN 55108 for more information about this publication. A more complete *Canola Growers Manual* on canola production is available from the Canola Council of Canada, 400-167 Lombard Ave, Winnipeg, Manitoba R3B 0T6 (telephone 204-982-2100). It contains detailed information on canola production practices and costs \$68.00 (U.S.). The Canola Council also provides free annual updates to keep the information in the manual current. Please keep in mind while using this manual, that not all pesticides used in Canada are legal in the United States. Always confirm the clearance of a pesticide with your local dealer or county extension educator.

Variety/Test Line Name Changes

Variety Name	Test Line
IMC 02	CID 4482
IMC 03	YA 307
IMC 130	CID 4477
CL20-20	EX-CG2020
CL 2070	PF7041/91
Clavet	SW 02516
Coronet	SW 02502
Hudson	M1-9099
Eagle	SW 02530
Challenger	SW 02549
Impulse	SW 02737

Table 1. Seed yield of canola (*Brassica napus* and *B. rapa*) varieties, in pounds per acre, at Roseau, Crookston, and Morris, Minnesota. [1]

Note Key:

- [1] Pounds per acre is measured at 10% moisture.
 [2] Source Codes refers to the "developer," "marketer" and "supplemental codes" noted in Table 4.
 [3] North means the average of Roseau and Crookston for 1995 and 1996.
 [4] State means the average of all trials and locations including 1995 results at Morris. No 1996 results are available for Morris.
 [5] Long-term averages at three locations for Global (1991-93, 1995-96) and Hyola 401 (1991-96) are 1,559 and 2,072, respectively.
 [6] PF 7041/91 renamed CL 2070; SW 02530 renamed Eagle; SW 02549 renamed Challenger.
 [7] Not tested at Crookston in 1996.
 [8] Not tested at Crookston in 1995 or 1996.

Locations: Rou=Roseau; Cr=Crookston.

Variety	Source Codes [2]	Rou	1996		1995-96	
			Cr	AVG	North [3]	State [4]
45A71	D14/M16	1583	1635	1609	—	—
46A05	D14/M16	1906	1752	1829	1833	1784
46A15	D14/M11	1882	2020	1951	—	—
46A65	D14/M16	2024	2352	2188	—	—
89B	D10/M8/SP	1509	1662	1586	—	—
96006	D5/M11/L	1374	1363	1369	—	—
96010	D5/M11/L	1777	1891	1834	—	—
96017	D5/M11/L	1369	1709	1539	—	—
BC 94-123	D4/M11	1605	—	—	—	—
Brigade	D15/M9	1676	1809	1743	1759	—
CL20-20	D18/M5/H/97	1809	—	—	—	—
Clavet	D15/M11	1818	—	—	—	—
CMT 103	D10/M8/SP	995	1224	1110	—	—
CN505	D6/M4	1687	1956	1822	—	—
CN509	D6/M4	1600	1572	1586	—	—
Coronet	D15/M11	1633	1836	1735	—	—
Crusher	D15/M9	1465	2111	1788	1802	1701
Defender	D15/M9	1857	1843	1850	1716	—
DP1/95	D9/15	1649	2050	1850	—	—
DP3/95	D9/15	1784	1886	1835	—	—
Ebony	D11/M10/O	1534	1817	1676	1668	1589
FE-107	D10/M8/SP	1652	1655	1654	—	—
Frontier	D3/M3	1536	1854	1695	1674	—
Global [5]	D15/M13	1525	2006	1766	1569	1502
Helios	D9/M17	1567	—	—	—	—
Hudson	D7/M5/97	1979	1730	1855	1911	1855
Hyola 308	D17/M9/H	2200	—	—	2103 [7]	2113
Hyola 330	D17/M9/H	2086	—	—	2274 [7]	2229
Hyola 401 [5]	D17/M9/H	2000	2284	2142	2196	2100
Hyola 420	D17/M9/H	2024	2104	2064	2096	2077

Table 1. Seed yield of canola (*Brassica napus* and *B. rapa*) varieties, in pounds per acre, at Roseau, Crookston, and Morris, Minnesota. [1]

Variety	Source Codes [2]	Rou	1996		1995-96	
			Cr	AVG	North [3]	State [4]
Hysyn 110	D17/M9	1640	—	—	1683 [7]	1578
IMC 02	D10/M8/SP	1587	2029	1808	—	—
IMC 03	D10/M8/SP	1817	2073	1945	—	—
IMC 130	D10/M8/SP	1302	1830	1566	—	—
Impact	D15/M5	1830	—	—	1628 [8]	—
Impulse	D15/M9	1440	1895	1668	1704	—
Jewel	D11/M10/O	2093	1536	1815	1791	1702
Legacy	D15/M12	1899	1963	1931	1864	—
LG 3260	D11/M10/O	1606	1746	1676	—	—
LG 3310	D11/M10	1893	1766	1830	—	—
LG 3369	D11/M10/O	1699	2201	1950	—	—
Magnum	D11/M1	1829	1631	1730	1882	1797
Mari	D7/M2	1569	1331	1450	1598	1670
Norseman	D15/M9	1758	1687	1723	1626	—
OAC Springfield	D13/M1/M5/M6	1785	—	—	1800 [7]	1715
OAC Summit	D13/M1	1937	2038	1988	1882	1822
Oscar	D1/M5	1756	1692	1724	1634	—
Pearl	D11/M10	1540	1668	1604	1588	1527
PF 7041/91 [6]	D12/M5/97	2007	2061	2034	—	—
PRO 4/95	D9/M17	1581	—	—	—	—
Quantum	D3/M3	2004	2190	2097	—	—
Reward	D16/M13	1480	1615	1548	1445	1391
SCH 006	D10/M8/H/97	2170	1865	2018	—	—
SCH 007	D10/M8/H	1924	2323	2124	—	—
Sponsor	D15/M1	1897	2275	2086	2002	—
SW 02530 [6]	D15/M11	1676	1730	1703	—	—
SW 02549 [6]	D15/M11	1660	2132	1896	—	—
SWLM 02578	D15/M11	1795	2420	2108	—	—
SWLM 02579	D15/M11	1970	2350	2160	—	—
Tobin	D2/M13	1351	1594	1473	1341	1272
Topscore	D9/M15	1680	2223	1952	1981	—
Trojan	D15/M12	1781	1707	1744	1614	1514
Victor	D8/M13	1754	—	—	1868 [8]	—
ZSCOO6	D17/M11	1567	—	—	—	—
Mean		1725	1879	1796	—	—
LSD 0.05		229	355	212	—	—

Table 2. Bloom, maturity and lodging characteristics of canola (*Brassica napus* and *B. rapa*) varieties at Roseau and Crookston, Minnesota (1996).

Note Key:

[1] Expressed as DAP (days after planting).

[2] Lodging Score: 1=erect, 9=flat. Lodging readings made August 14 at Roseau and July 30 at Crookston.

Variety	10% Bloom		90% Bloom		Maturity		Lodging	
	Rou [1]	Cr [1]	Rou [1]	Cr [1]	Rou [1]	Cr [1]	Rou [2]	Cr [2]
45A71	40	38	63	63	81	85	3.5	8.0
46A05	41	39	64	63	85	87	4.3	7.5
46A15	38	37	59	58	85	82	3.0	7.3
46A65	40	38	63	62	87	88	3.3	5.8
89B	41	39	63	59	85	85	5.3	8.0
96006	45	47	69	71	94	94	2.8	4.3
96010	40	36	65	64	87	85	4.5	7.3
96017	46	45	68	69	92	92	4.3	7.0
BC 94-123	40	—	62	—	83	—	2.8	—
Brigade	41	39	65	67	85	90	2.3	4.5
CL20-20	37	—	58	—	83	—	3.5	—
Clavet	41	—	65	—	85	—	3.0	—
CMT 103	45	45	69	69	91	93	6.8	8.3
CN505	42	39	64	65	87	92	2.0	6.8
CN509	39	37	60	59	78	81	4.3	8.0
Coronet	41	39	65	68	84	90	3.0	6.5
Crusher	44	43	67	69	89	91	2.5	1.8
Defender	40	38	63	65	86	85	3.0	8.3
DP1/95	42	39	64	63	87	89	3.8	5.5
DP3/95	43	43	67	69	93	95	4.5	6.5
Ebony	44	42	65	65	91	94	3.3	5.3
FE-107	39	36	59	58	83	80	4.5	8.5
Frontier	40	39	62	63	84	86	3.8	8.0
Global	45	44	70	69	93	93	3.8	3.8
Helios	45	—	69	—	92	—	3.8	—
Hudson	39	37	59	58	83	80	3.5	7.3
Hyola 308	36	—	54	—	75	—	3.8	—
Hyola 330	36	—	54	—	79	—	4.0	—
Hyola 401	38	34	58	56	85	87	3.3	5.3
Hyola 420	39	35	60	58	85	86	2.3	6.3
Hysyn 110	31	—	52	—	69	—	2.0	—
IMC 02	42	40	65	63	88	91	5.3	7.5
IMC 03	42	40	64	65	87	92	5.3	8.5
IMC 130	44	44	66	64	87	90	5.8	8.0
Impact	40	—	65	—	87	—	4.3	—
Impulse	44	44	69	69	92	93	3.5	3.8
Jewel	40	38	63	62	87	87	3.8	6.5
Legacy	39	37	63	63	86	86	4.0	6.8
LG 3260	39	36	59	58	81	84	4.5	6.0
LG 3310	41	39	66	67	87	88	4.3	6.0

Table 2 continued. Bloom, maturity and lodging characteristics of canola (*Brassica napus* and *B. rapa*) varieties at Roseau and Crookston, Minnesota (1996).

Variety	10% Bloom		90% Bloom		Maturity		Lodging	
	Rou [1]	Cr [1]	Rou [1]	Cr [1]	Rou [1]	Cr [1]	Rou [2]	Cr [2]
LG 3369	40	38	64	61	90	88	4.5	6.3
Magnum	42	39	64	64	88	84	3.5	5.8
Mari	45	45	68	69	88	88	4.0	6.5
Norseman	42	39	67	68	89	90	4.0	5.8
OAC Springfield	39	—	56	—	84	—	4.5	—
OAC Summit	43	43	64	67	88	90	3.8	7.3
Oscar	44	43	67	71	93	95	3.0	5.8
Pearl	42	39	65	68	88	89	4.8	8.3
PF 7041/91	41	40	65	68	90	92	3.0	6.5
PRO 4/95	42	—	68	—	91	—	3.5	—
Quantum	40	38	64	65	86	89	3.0	5.8
Reward	32	29	52	56	69	71	3.0	7.5
SCH 006	41	38	65	63	89	85	3.3	7.8
SCH 007	41	38	63	61	87	89	4.3	6.0
Sponsor	44	43	66	66	89	92	3.0	4.5
SW 02530	39	38	65	64	85	86	4.0	7.3
SW 02549	43	41	67	68	89	91	3.0	4.8
SWLM 02578	41	39	66	67	89	89	2.5	3.8
SWLM 02579	41	40	65	69	89	91	2.8	7.0
Tobin	31	29	53	56	68	70	2.3	5.3
Topscore	42	41	66	67	88	90	4.5	6.0
Trojan	40	39	66	67	88	91	4.3	6.5
Victor	42	—	63	—	86	—	3.5	—
ZSCOO6	32	—	52	—	71	—	2.0	—
Mean	40	39	63	64	86	88	3.7	6.4
LSD (0.05)	1	1	2	2	3	3	1.5	2.0

Table 3. Height, test weight, sclerotinia susceptibility and oil characteristics of canola varieties at Roseau and Crookston, Minnesota (1996).

Note Key:

[1] Height expressed in inches.

[2] Test weight expressed in pounds per bushel, based on 5% moisture.

[3] Sclerotinia infection (white mold): notes taken between 90% bloom and physiological maturity. Scores are visual estimates of percent plants infected.

[4] Oil based on 5% moisture.

Locations: Rou=Roseau; Cr=Crookston.

Variety	Height [1]		Test Weight [2]		Sclerotinia [3]		Oil [4]	
	Rou	Cr	Rou	Cr	Rou	Cr	Rou	Cr
45A71	50	53	51.1	51.4	8	28	41.0	40.7
46A05	49	46	51.2	51.8	3	24	43.0	41.9
46A15	46	45	51.6	51.9	4	28	44.9	42.9
46A65	53	52	50.8	49.8	4	9	43.7	44.0
89B	47	50	51.3	51.3	14	34	42.8	41.7
96006	49	52	50.9	51.3	0	2	39.6	37.3
96010	47	50	51.5	52.5	2	13	44.0	40.3
96017	54	51	51.5	50.9	0	9	43.1	40.6
BC 94-123	49	—	50.7	—	1	—	44.5	—
Brigade	52	54	51.6	51.4	3	6	41.9	41.3
CL20-20	43	—	51.0	—	2	—	43.0	—
Clavet	49	—	50.5	—	0	—	43.1	—
CMT 103	50	51	51.1	50.7	6	3	40.9	40.0
CN505	52	55	49.5	49.1	1	9	45.4	42.6
CN509	48	51	51.0	52.3	0	21	43.2	41.7
Coronet	51	55	50.4	51.7	1	13	42.8	41.0
Crusher	52	57	52.1	52.5	1	2	41.8	41.9
Defender	51	55	51.4	52.0	4	33	43.4	40.9
DP1/95	49	52	51.2	51.1	9	16	42.5	41.7
DP3/95	55	61	51.4	51.3	0	14	42.4	42.5
Ebony	55	52	50.6	49.0	1	7	44.1	42.5
FE-107	46	48	51.8	52.4	10	38	43.8	41.9
Frontier	46	54	51.4	52.1	6	19	44.7	41.0
Global	55	57	51.0	50.5	0	2	41.8	40.7
Helios	56	—	51.2	—	0	—	40.7	—
Hudson	49	51	51.0	51.9	4	28	45.1	42.1
Hyola 308	43	—	51.3	—	0	—	41.4	—
Hyola 330	43	—	48.9	—	0	—	42.1	—
Hyola 401	44	45	51.0	51.4	4	9	42.4	41.0
Hyola 420	48	50	51.0	50.9	1	15	43.8	43.2
Hysyn 110	49	—	52.4	—	0	—	41.7	—
IMC 02	49	56	51.0	50.9	1	14	44.2	43.5
IMC 03	51	54	50.9	50.7	3	9	43.7	41.8
IMC 130	49	54	51.9	51.2	13	10	42.0	41.2
Impact	52	—	51.7	—	2	—	43.1	—

Table 3 continued. Height, test weight, sclerotinia susceptibility and oil characteristics of canola varieties at Roseau and Crookston, Minnesota (1996).

Variety	Height [1]		Test Weight [2]		Sclerotinia [3]		Oil [4]	
	Rou	Cr	Rou	Cr	Rou	Cr	Rou	Cr
Impulse	54	55	51.9	52.0	1	4	41.6	41.1
Jewel	49	54	50.8	51.4	4	11	44.6	41.4
Legacy	50	53	51.3	51.9	11	28	42.7	40.4
LG 3260	47	51	52.4	51.8	18	14	43.8	43.2
LG 3310	51	55	50.7	51.3	1	14	42.7	41.7
LG 3369	48	53	51.5	51.5	9	17	43.3	41.8
Magnum	50	54	50.0	51.0	1	6	44.1	42.3
Mari	50	57	52.0	52.8	4	14	44.2	39.2
Norseman	53	56	51.8	51.9	3	7	42.1	41.4
OAC Springfield	43	—	50.3	—	2	—	46.0	—
OAC Summit	50	54	51.2	51.7	1	10	45.4	40.6
Oscar	49	48	52.0	51.8	0	4	41.9	37.9
Pearl	49	57	51.3	52.1	8	33	42.0	40.7
PF 7041/91	49	57	50.2	50.0	0	5	43.9	42.0
PRO 4/95	53	—	51.0	—	1	—	41.1	—
Quantum	54	56	51.8	52.5	0	7	44.0	41.5
Reward	45	42	51.8	51.9	0	0	43.2	40.2
SCH 006	51	55	51.7	52.1	1	33	42.5	40.1
SCH 007	51	52	51.5	51.4	5	13	42.8	41.3
Sponsor	58	58	52.4	52.0	2	8	41.3	41.3
SW 02530	54	52	51.7	52.1	10	28	40.8	41.1
SW 02549	54	56	51.8	51.4	1	8	42.6	41.6
SWLM 02578	52	54	51.2	51.1	1	1	42.0	41.7
SWLM 02579	55	55	50.6	50.7	1	19	42.1	41.0
Tobin	43	42	52.5	52.7	0	0	42.0	40.1
Topscore	53	59	51.8	51.1	4	5	42.6	41.0
Trojan	52	58	51.3	51.4	3	26	41.7	39.5
Victor	53	—	51.2	—	2	—	43.5	—
ZSCOO6	48	—	52.3	—	0	—	41.8	—
Mean	50	53	51.3	51.5	3	14	42.9	40.5
LSD 0.05	4	6	0.6	0.5	7	15	—	—

Table 4. Canola seed sources, 1997. Categorized under "developer" or "marketer" and listed alphabetically in each group.

Note Key:

[1] Coding to left of each developer and marketer is keyed to Source Codes column in Table 1.

[2] Letter codes designating additional variety characteristics or availability considerations.

Developers [1]:

D1 Ag Seed Research, Victoria, Australia
 D2 Agriculture Canada, Saskatoon, Saskatchewan, Canada
 D3 Alberta Wheat Pool, Alberta, Canada
 D4 Bonis & Company Ltd., Lindsay, Ontario, Canada
 D5 Calgene, Leesburg, Georgia

D6 Cargill Hybrid, Fort Collins, Colorado
 D7 Danisco Seed, Maribo Seeds, Copenhagen, Denmark
 D8 Danish Plant Breeders
 D9 DLF Trifolium, Germany
 D10 InterMountain Canola - Cargill Foods, Spokane, Wash.

D11 Limagrain Genetics, Saskatoon, Saskatchewan, Canada
 D12 NPZ-Lembke, Germany
 D13 Ontario Agricultural College, Guelph, Ontario, Canada
 D14 Pioneer Hybrid International, Georgetown, Ontario, Canada
 D15 Svalof Weibull Seed, Lindsay, Ontario, Canada

D16 University of Manitoba
 D17 Zeneca Seeds, Winnipeg, Manitoba, Canada
 D18 Developer not revealed

Marketers [1]:

M1 Agri-Tel Grain Ltd., Box 808, Beausejour, MB, CANADA R0E 0C0
 M2 Brett-Young Seeds, Box 99, St. Norbert P.S., Winnipeg, MB, CANADA R3V 1L5
 M3 Calgene, RR 2 Box 207, Park River, ND 58270
 M4 Cargill Hybrid, 2540 E. Drake Rd., Fort Collins, CO 80525
 M5 Cenex-Land 'O Lakes, P.O. Box 1291, Minot, ND 58702

M6 Cloutier Agra Seeds Inc., 3497 Pembina Hwy., Winnipeg, MB, CANADA R3V 1A4
 M7 ICI Seeds, 266 Williamsburg Cl., Idaho Falls, ID 83404
 M8 InterMountain Canola - Cargill Foods, E. 11322 37th Ave., Spokane, WA 99206
 M9 Interstate Payco Seed, West Fargo, ND
 M10 Limagrain Canada Seed, 4-411 Downy Rd., Saskatoon, SK, CANADA S7N 4L8

M11 Marketing not determined
 M12 Mycogen Plant Sciences, Prescott, WI
 M13 Northern Sales, 135 Lombard Ave., Winnipeg, MB, CANADA R3B 0T4
 M14 Pioneer Hybrid Inter., 12111 Mississavga Rd., RR 4, Georgetown, ON, CANADA L7G 4S7
 M15 Proseed, 110 E. 7th, Box 69, Harvey, ND 58341

Table 4 continued. Canola seed sources, 1997. Categorized under "developer" or "marketer" and listed alphabetically in each group.

M16 Proven Seed, Manitoba

M17 SeedTec International, P.O. Box 40, Bozeman, MT 59771-0040

Supplemental Codes [2]:

H Hybrid
 O High Oil
 L Laurate Canola
 SP Specialty Oil
 97 Available in 1997

Canola Planting Rate and Date

Rate is based on normal seedbeds and on normal size, good quality seed. Rate used can vary greatly depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting and planting equipment. Weight given is the most widely accepted in the U.S.

Crop Use	Bushel Weight (pounds)	Seeds/pound (number)	Rate/acre (pounds)	Rate (seeds)	Planting Date
<i>B napus</i>	50	140,000	8	25/square foot	May
<i>B rapa</i>	50	210,000	5	25/square foot	May

SOYBEAN VARIETY TRIALS

**Minnesota Agricultural Experiment Station — University of Minnesota
December 1996**

Results of Soybean Variety Tests Conducted by the Minnesota Agricultural Experiment Station. This report was prepared by James Orf, agronomist, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108. [phone: 612/625-8275; e-mail: <orfxx001@maroon.tc.umn.edu>].

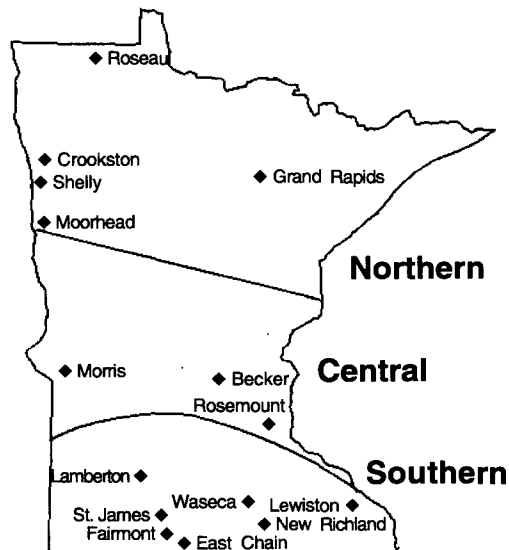
SOYBEAN

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 2 to 7 deal with varieties developed by publicly supported institutions and are being considered for recommendation by Minnesota Agricultural Experiment Station. Tables 8 to 11 show performance characteristics of privately developed varieties as well as several public varieties.

Performance trials were conducted at various locations in the northern, central and southern zones (see map). Specific test locations for each zone are indicated in each table. Becker was the only irrigated test location. Trials were planted between May 5 and June 5 unless otherwise indicated. Row spacings vary in some tables.

Soybean Maturity Zones



Variety Selection Considerations

Several major factors need to be considered in selecting varieties, including 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.

Relative maturity ratings are shown in the tables. These consist of a maturity group designation followed by a number (varying from 0-9) which indicates the ranking within each maturity group. For example, Agassiz with a relative maturity rating of 0.0, is the earliest group 0 maturity variety while Dassel with a rating of 0.9 is the latest. These rating designations are the result of our experience with the variety over years and test locations.

The relative maturity ratings in the tables for the private varieties were provided by the companies which market them.

Yield—Varieties in each table are listed in order to their actual 1996 maturity date and not on the basis of their long term relative maturity designation. Later maturing varieties are normally expected to have higher yield potential than earlier maturing varieties. Compare yields, by looking at varieties with a similar maturity rating. Yield comparisons are more reliable if data are available for several years. Data from different tables should not be compared. All yield data reported in these tables were obtained from replicated tests harvested with a plot combine.

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, one can assume 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—Ratings for chlorosis are an indication of how much leaf yellowing occurs in tests conducted on a high lime (high pH) soil near Lamberton. They indicate how well varieties perform relative to each other on such soils. How these ratings relate to the numerical values used in soybean variety trial reports previous to 1995 is:

Pre-1995 Numerical Score	Current Rating Designation
1-2	Resistant (R)
2.1-3	Moderately Resistant (MR)
3.1-4	Moderately Susceptible (MS)
4.1-5	Susceptible (S)

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 1. Genes for resistance to races of Phytophthora root rot (shading indicates resistance).

	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	■	■																								
Rps1b		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Rps1c				■	■									■												
Rps1k																										
Rps3							■	■																		
Rps4						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Rps6																										

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 present 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 was first identified in Minnesota in 1978 and is now known to occur in 32 Minnesota counties, according to Cooperative Pest Survey Program data. Areas infested and numbers of nematodes both appear to be increasing. When SCN numbers are high, significant yield losses can occur. Several races of SCN are known to occur in Minnesota. Rotations to non-host crops and planting resistant varieties assist in managing nematode populations.

Results of a special performance test of public and private varieties resistant to soybean cyst nematode are provided in Tables 11A and 11B. These trials were conducted on “infested” sites near East Chain, New Richland and St. James and on “non-infested” sites at Fairmont, Lamberton and Waseca.

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, Minne-

sota 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 occur where soybeans are planted every other year. Resistant varieties, or longer rotations out of soybeans, assist in the management of this disease. See text descriptions of public varieties for information about their resistance to this fungus.

Some information refers to “tolerance” or “field resistance.” Reliable tests for tolerance have not yet been developed.

White Mold—Sclerotinia stem rot was less damaging to the 1996 crop than it was in 1994. Ratings of varieties for resistance to Sclerotinia are difficult to obtain because infection is dependent upon environmental conditions during and after flowering. Varieties that appear to be resistant one year can be devastated by the disease the next year if conditions are right for the disease to spread. Growers should expect that varieties that consistently have less disease over several years will be the best performers under high disease pressure. A reliable test for resistance is not yet available.

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 converts the protein and oil value to another moisture basis:

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

The value of a bushel of soybeans based on oil and protein content is calculated by:

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

Where:

- APV = approximate value of a bushel of soybeans
- 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: $\frac{\text{price of meal } \$/\text{ton}}{2000} = \$/\text{pound}$

Recommended Publicly Developed Varieties

Agassiz—Northern zone. Relative maturity 0.0. 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. Plant Variety Protection Act.

Archer—Southern zone. Relative maturity 1.9. Yield, brown stem rot resistance and iron chlorosis resistance similar to BSR 101. *Rps1k and Rps6 genes for resistance to phytophthora*. Released 1989 by Iowa Agricultural Experiment Station. Seed Sale regulated by U.S. Plant Variety Protection Act.

Bell—Southern zone. Relative maturity 2.2. *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. Plant Variety Protection Act.

Bert—Southern zone. Relative maturity 1.8. High yield 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. Plant Variety Protection Act.

Council—Northern zone. Relative maturity 0.5. High yield. *Rps1 gene for resistance to phytophthora*. Developed by North Dakota Agricultural Experiment Station. Released 1995. Seed sales regulated by U.S. Plant Variety Protection Act, PVP(94). Seed will be widely available in 1997.

Evans—Central zone. Relative maturity 0.6. *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.

Faribault—Central and southern zones. Relative maturity 1.9. *Resistant to race 3 and moderately resistant to race 1 of soybean cyst nematode*. Different source of soybean cyst nematode resistance than Freeborn and Bell. Recommended as part of a management package for producers with a soybean cyst nematode problem. Good yield potential. Resistant to brown stem rot. *Rps1 gene for resistance to phytophthora*. Developed by Minnesota Agricultural Experiment Station. Released in 1994. Seed sales regulated by U.S. Plant Variety Protection Act, PVP(94).

Freeborn—Central and southern zones. Relative maturity 1.6. *Resistant to race 3 of soybean cyst nematode*. Good yield potential. Resistant to brown stem rot. *Rps1 gene for resistance to phytophthora*. Recommended as part of a management package for producers with a soybean cyst nematode problem. Developed by Minnesota Agricultural Experiment Station. Released 1995. Seed sales regulated by U.S. Plant Variety Protection Act, PVP(94).

Glacier—Northern zone. Relative maturity 00.8. High yield. *Rps6 gene for resistance to phytophthora*. Developed by Minnesota Agricultural Experiment Station. Released 1995. Seed sales regulated by U.S. Plant Variety Protection Act, PVP(94).

Granite—Central and southern zones. Relative maturity 1.8. High yield. Resistant to brown stem rot. *Rps1 gene for resistance to phytophthora*. Developed by Minnesota Agricultural Experiment Station. Released 1995. Seed sales regulated by U.S. Plant Variety Protection Act, PVP(94).

Hardin 91—Southern zone. Relative maturity 2.0. Good yield potential. *Rps1k gene for resistance to phytophthora*. Developed by Iowa Agricultural Experiment Station. Released under royalty agreement by Iowa State University Research Foundation, 1991. License required for seed production.

Hendricks—Central zone. Relative maturity 0.9. High yield. Good lodging resistance. *Rps1 gene for resistance to phytophthora*. Developed by Minnesota Agricultural Experiment Station. Released in 1994. Seed sales regulated by U.S. Plant Variety Protection Act.

IA2008—Southern zone. Relative maturity 2.2. High yield potential. *Rps1 gene for resistance to phytophthora*. Released 1991. Developed by Iowa Agricultural Experiment Station. Released under royalty agreement by Iowa State University Research Foundation, 1991. License required for seed production.

IA2008R—Southern zone. Relative maturity 2.2. High yield potential. Resistant to brown stem rot. Similar to IA2008 except *Rps1k gene for resistance to phytophthora*. Developed by Iowa Agricultural Experiment Station. Released under royalty agreement by Iowa State University Research Foundation, 1995. License required for seed production. Seed will be widely available in 1997.

IA2021—Southern zone. Relative maturity 2.1. High yield potential. *Rps1k gene for resistance to phytophthora*. Developed by Iowa Agricultural Experiment Station. Released under royalty agreement by Iowa State University Research Foundation, 1995. License required for seed production. Seed will be widely available in 1997.

Kato—Central and southern zones. Relative maturity 1.3. 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. Plant Variety Protection Act.

Lambert—Central zone. Relative maturity 0.8. 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. Plant Variety Protection Act.

McCall—Northern zone. Relative maturity 00.7. 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. Relative maturity 0.3. 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. Plant Variety Protection Act.

Parker—Southern zone. Relative maturity 1.5. 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. Plant Variety Protection Act.

Sturdy—Southern zone. Relative maturity 2.1. High yield potential. Good lodging resis-

tance and iron chlorosis resistance. *Rps1 gene for resistance to phytophthora*. Developed by Minnesota Agricultural Experiment Station. Released 1989. Seed sale regulated by U.S. Plant Variety Protection Act.

Not Adequately Tested Publicly Developed Variety

IA1006—Southern zone. Relative maturity 1.6. Excellent yield potential. Good lodging resistance. *Resistant to brown stem rot*. Developed by Iowa Agricultural Experiment Station. Released under royalty agreement by Iowa State University Research Foundation, 1996. License required for seed production. Seed will be widely available in 1998.

Other Publicly Developed Varieties

BSR 101—Southern zone. Relative maturity 1.9. 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.

Corsoy 79—Southern zone. Relative maturity 2.2. Very good yield performance. *Rps1c gene for phytophthora resistance*. Poor chlorosis ratings, somewhat lodging susceptible. Developed by Illinois Agricultural Experiment Station. Released 1979.

Dassel—Central zone. Relative maturity 0.9. 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. Plant Variety Protection Act.

Dawson—Central zone. Relative maturity 0.6. Very good tolerance to iron chlorosis on high lime soils. Good yield and lodging resistance. *Rps1 gene for resistance to phytophthora but quite susceptible to race 3*. Developed by Minnesota Agricultural Experiment Station. Released 1983. Seed sale regulated by U.S. Plant Variety Protection Act.

Harden—Southern zone. Relative maturity 1.7. Good yield performance. *Rps1 gene for resistance to phytophthora*. Developed by Iowa Agricultural Experiment Station. Released 1980. Seed sale regulated by U.S. Plant Variety Protection Act.

Hodgson 78—Central and southern zones. Relative maturity 1.4. Average yield. *Rps1 gene for resistance to phytophthora*. Developed by Minnesota Agricultural Experiment Station. Released 1978.

Kasota—Central and Southern zones. Relative maturity 1.3. 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. Plant Variety Protection Act.

Special Purpose Publicly Developed Varieties

Chico—Small-seeded variety for specialty markets. Relative maturity 0.2. Seed weight is about 5 grams per 100 seeds less than Agassiz. Yields less than Agassiz. *Rps1 gene for*

resistance to phytophthora. Developed by Minnesota Agricultural Experiment Station. Released 1983.

Danatto—Small-seeded variety for specialty markets. Relative maturity 0.4. Seed size similar to Minnatto. Developed by North Dakota Agricultural Experiment Station. Released in 1996. Seed sales regulated by U.S. Plant Variety Protection Act PVP (94).

Grande—Relatively large seeded variety for specialty markets. Relative maturity 0.6. 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. Relative maturity 0.7. 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. Plant Variety Protection Act. (Contact Sigco Sun Products, Inc., Breckenridge, MN, for information).

Proto—Very high protein variety for specialty markets. Relative maturity 0.6. Protein content 3 to 5 percent higher than other varieties. Yields less than Evans. Susceptible to phytophthora. Developed by Minnesota Agricultural Experiment Station. Released 1989.

Toyopro—Very high protein variety for specialty markets. Relative maturity 0.8. Protein content 3 percent to 5 percent higher than other varieties. Yields less than Lambert. Developed by Minnesota Agricultural Experiment Station. Released 1995. Seed sale regulated by U.S. Plant Variety Protection Act, PVP(94) (contact Northland Organic Foods, St. Paul, MN for information).

Vinton 81—Large-seeded, special purpose variety. Relative maturity 1.8. 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

These private companies entered varieties in the 1996 Minnesota tests. Brand names are noted in parentheses (). List is sorted alphabetically by company name.

AgriPro Seeds, Inc., R.R. 2, Highway 30 East, Ames, IA 50010 (AgriPro)
Albert Lea Seed House, P.O. Box 127, 1414 W. Main, Albert Lea, MN 56007 (Viking)
Cenex/Land O'Lakes, 2827 8th Ave. South, Fort Dodge, IA 50501 (Cenex/LOL)
Ciba Seeds, 211 Landmark Drive, Suite D4, Normal, IL 61761 (Ciba)
Dahlman Seeds, 73504 200th St., Dassel, MN 55325 (Dahlman)

Dairyland Seed Co., Inc., P.O. Box 958, 3570 Highway H, West Bend, WI 53095
(Dairyland)
DEKALB Genetics Corp., 3100 Sycamore Rd., DeKalb, IL 60115 (DEKALB)
Dennis Ewing Farm Seed, R.R. 2, Box 272T, Ames, IA 50010 (Yield King)
Domestic Seed & Supply, Box 466, Madison, SD 57042 (Mustang)
Ehrich Seed Farms, Inc., R.R. 1, Box 47, Elmore, MN 56027 (Ehrich)

Gold Country Seed, 220 W. Elm St., Norwood, MN 55368 (GCS)
Golden Harvest Seeds, The J.C. Robinson Seed Co., 100 J.C. Robinson Blvd., P.O. Box
A, Waterloo, NE 68069 (Golden Harvest)
Great Lakes Hybrids, Inc., 9915 W. M-21, Ovid, MI 48866 (Grt. Lks.)
Hy-Vigor Seeds, Inc., 4970 Redwood Ave., Paullina, IA 51046 (Hy-Vigor)
ICI Seeds, 2369 330th St., Box 500, Slater, IA 50244 (ICI)

Interstate Payco Seed Company, Box 338, 1215 Prairie Parkway, West Fargo, ND 58078
(Payco)
Jacobsen Hybrid Corn Co., Inc., 129 9th St., Box 379, Lake View, IA 51450 (Jacobsen)
Kaltenberg Seed Farms, Inc., 5506 Highway 19, P.O. Box 278, Waunakee, WI 53597
(Kaltenberg)
Kruger Seed Company, Highway 20 East, Dike, IA 50624 (Kruger)
KSC/Challenger, Box A, Dike, IA 50624 (KSC/Challenger)

Latham Seed Company, 131 180th St., Alexander, IA 50420 (Latham)
Latham Brothers Farm, 131 180th St., Alexander, IA 50420 (Latham)
LG Seeds, 925 Dexter St., Box 216, Prescott, WI 54021 (LG Seeds)
Midwest Seed Genetics, P.O. Box 518, Carroll, IA 51401 (MSG)
Mycogen Seeds, P.O. Box 21428, St. Paul, MN 55121-1428 (Mycogen)

Northrup King, 7500 Olson Mem. Hy., Golden Valley, MN 55427 (NK)
Pioneer Hi-Bred Int'l, Inc., 130 SE Willmar Ave., Willmar, MN 56201 (Pioneer)
Prairie Brand Seed Company, 15 X Ave., Story City, IA 50248 (Prairie Brand)
Prairie Brand Research, 15 X Ave., Story City, IA 50248 (PBR)
Profiseed, Inc., 1691 Highway 65 North, Hampton, IA 50441 (Profiseed)

Ramy International, LTD., P.O. Box 3722, 1329 N. Riverfront Drive, Mankato, MN 56001
(Ramy)
Renk Seed Co., 6800 Wilburn Rd., Sun Prairie, WI 53590 (Renk)
Sand Seed Service, Inc., 4765 Highway 143, Marcus, IA 51035 (Sands)
Sansgaard Seed Farms, Inc., 15 X Ave., Story City, IA 50248 (Sansgaard)
Semences Prograin, Inc., 145 Bas Riviere Nord, St.-Cesaire, Quebec, Canada J0L 1T0
(Semences)

Star Brand Seed, 4765 Highway 143, Marcus, IA 51035 (Star)
Stine Seed Farm, 2225 Laredo Trail, Adel, IA 50003 (Stine)
Stine Seed Co., 2225 Laredo Trail, Adel, IA 50003 (Stine)
Terra International, Inc., 600 4th St., P.O. Box 6000, Sioux City, IA 51102-6000 (Terra)
Thompson Agronomics, Inc., 40321 130th Ave., Leland, IA 50453 (Thompson)

Thompson Seeds, Inc., 40321 130th Ave., Leland, IA 50453 (Thompson)
UAP Seed Company, P.O. Box 5015, 1230 40th St. NW, Fargo, ND 58105-5015 (Dyna-
Gro)
UAP Seeds/Dyna-Gro, P.O. Box 55, Kasota, MN 56050 (Dyna-Gro)
Ziller Seed Co., Inc., Rte 1, Box 122, Bird Island, MN 55310 (Ziller)

Table 2. Yields in bushels per acre of publicly developed soybean varieties in northern zone (1992-96). Sorted by growing zone maturity date, earliest to latest.

Note Key:

[1] 1994-96 data adjusted to 5 year average.

[2] 1993-96 data adjusted for 5 year average.

[3] 1992-94, 1996 data.

[4] 1994, 1996 data adjusted for 4 year average.

[5] 1993, 1994, 1996 data adjusted to 4 year average.

Locations: Cr=Crookston; GRap=Grand Rapids; Mor=Moorhead; Rou=Roseau; Sh=Shelly.

Variety	Cr	GRap	Mor	Rou	Sh [3]
McCall	36	19	28	25	39
Glacier	38 [1]	22	38 [1]	28	35 [4]
Agassiz	41	23	27	25	40
Ozzie	35	—	33	—	36
Council	—	—	39 [2]	—	42 [5]
Dawson	44	—	33	—	40
Evans	44	—	36	—	34
Lambert	47	—	35	—	44
Hendricks	42 [1]	—	40 [1]	—	40 [4]
Toyopro	42 [1]	—	32 [1]	—	37 [5]
LSD 0.20	2	1	2	1	1

Table 3. Yields in bushels per acre of publicly developed soybean varieties in central zone (1992-96). Sorted by growing zone maturity date, earliest to latest.

Note Key:

[1] Grown in 10-inch rows.

[2] Grown in 30-inch rows.

Locations: Ros=Rosemount; Mor=Morris; Be=Becker; AVG=average for all three sites.

Variety	Ros [1]	Mor [1]	Be [2]	AVG
Ozzie	39	43	44	42
Evans	40	46	42	43
Dawson	42	46	41	43
Lambert	45	49	51	49
Hendricks	44	47	48	46
Kato	41	46	43	44
Parker	45	52	48	48
Bert	46	50	46	47
LSD 0.20	2	2	2	1

Table 4. Yields in bushels per acre of publicly developed soybean varieties in southern zone (1992-96). Sorted by growing zone maturity date, earliest to latest.

Note Key:

[1] 1993-96 data, adjusted to 5-year average.

[2] 1994-96 data, adjusted to 5-year average.

[3] 1995-96 data, adjusted to 5-year average.

[4] 1993-96 data.

[5] 1995-96 data, adjusted to 4-year average.

[6] Mid-May planting.

[7] Mid-June planting.

[8] Grown in 10-inch rows.

[9] Grown in 30-inch rows.

Locations: Was=Waseca, Lam=Lamberton, Fai=Fairmont, Lew=Lewiston, AVG=average for all sites.

Variety	Was and Lam		Fai [6,9]	Was [6,8]	Lam [6,8]	Lew [4,6,9]	AVG
	[6]	[7]					
McCall	—	28	—	—	—	—	—
Agassiz	—	33	—	—	—	—	—
Ozzie	43	30	29	43	43	—	38
Dawson	49	33	31	48	50	46	44
Council	50 [3]	—	33 [3]	50 [3]	50 [3]	—	44 [3]
Evans	47	34	30	47	47	47	43
Lambert	52	39	34	49	55	51	47
Hendricks	52 [1]	38 [2]	36 [1]	49 [1]	54 [1]	52 [2]	48 [1]
Kato	—	39	42	52	55	52	50
Parker	61	44	42	59	63	53	54
Freeborn	50	—	42	50	51	54 [2]	49
Hardin 91	59	39	39	58	59	58	53
Bert	55	41	39	53	57	58	54
Granite	59	37 [2]	39	58	60	55	53
Faribault	52	33 [2]	40	48	55	53 [2]	49
Sturdy	58	35	42	55	60	58	54
Archer	56	36	38	54	58	50	50
IA2021	63 [3]	—	45 [3]	58 [3]	68 [3]	59 [5]	57 [3]
IA2008	62	38	42	60	64	59	56
IA2008R	62 [3]	—	43 [3]	57 [3]	66 [3]	—	55 [3]
LSD 0.20	1	1	1	2	2	2	1

Table 5. Characteristics of publicly developed soybean varieties (1996) for northern zone. Sorted by maturity date for mid-May planting.

Note Key:

[1] Maturity date, from mid-May planting date.

[2] Maturity date, from mid-June planting date.

[3] Lodging score: 1=excellent, 5=very poor.

[4] Height expressed in inches.

[5] PR=Phytophthora resistance: Rps#=gene present, S=susceptible,

[6] Protein and oil percentages, based on 13% moisture.

[7] CR=Chlorosis rating: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible.

Variety	Maturity Date		Lodging [3]	Height [4]	PR [5]	Protein [6]	Oil [6]	CR [7]
	[1]	[2]						
McCall	9-12	—	1.2	31	S	34.5	17.6	MR
Glacier	9-18	—	1.7	35	Rps6	35.9	17.3	MS
Chico	9-19	—	1.5	33	Rps1	36.4	18.7	MS
Agassiz	9-23	—	1.2	33	Rps1	34.7	17.4	MR
Danatto	9-27	—	2.7	34	S	35.1	16.8	MR
Ozzie	9-28	—	1.2	35	Rps1	37.5	16.6	MR
Council	9-29	—	1.2	38	Rps1	34.4	17.6	MR
Dawson	9-29	—	1.8	39	Rps1	33.9	18.0	MR
Proto	9-29	—	2.2	34	S	37.5	16.7	S
Evans	10-1	—	2.2	41	Rps1	34.5	18.2	MS
Lambert	10-2	—	1.7	38	Rps1	35.1	18.0	MR
Hendricks	10-3	—	1.0	39	Rps1	35.8	17.5	MS
Toyopro	10-3	—	1.2	36	S	38.0	16.1	S
Minnatto	10-4	—	1.0	35	Rps1	35.3	17.4	MR

Table 6. Characteristics of publicly developed soybean varieties (1996) for central zone. Sorted by maturity date for mid-May planting.

Note Key:

[1] Maturity date, from mid-May planting date.

[2] Maturity date, from mid-June planting date.

[3] Lodging score: 1=excellent, 5=very poor.

[4] Height expressed in inches.

[5] PR=Phytophthora resistance: Rps#=gene present, S=susceptible,

[6] Protein and oil percentages, based on 13% moisture.

[7] CR=Chlorosis rating: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible.

Variety	Maturity Date		Lodging [3]	Height [4]	PR [5]	Protein [6]	Oil [6]	CR [7]
	[1]	[2]						
McCall	9-4	—	1.3	30	S	34.7	18.2	MR
Glacier	9-7	—	1.7	30	Rps6	35.9	17.7	MS
Chico	9-9	—	2.0	34	Rps1	35.3	17.6	MS
Agassiz	9-10	—	1.3	33	Rps1	35.1	18.0	MR
Danatto	9-11	—	3.0	33	S	34.5	17.4	MR
Ozzie	9-12	—	1.3	33	Rps1	36.2	17.0	MR
Proto	9-13	—	1.5	27	S	38.7	16.6	S
Council	9-13	—	1.3	32	Rps1	34.7	18.1	MR
Evans	9-14	—	2.0	37	Rps1	35.0	18.2	MS
Dawson	9-14	—	1.8	34	Rps1	34.6	18.4	MR
Lambert	9-15	—	1.5	34	Rps1	34.6	18.5	MR
Toyopro	9-16	—	1.3	32	S	39.0	16.4	S
Hendricks	9-17	—	1.5	32	Rps1	35.8	17.7	MS
Minnatto	9-18	—	2.0	31	Rps1	36.7	16.9	MR
Kato	9-19	—	1.7	37	Rps1	38.9	16.5	MS
Parker	9-21	—	2.2	41	Rps1	35.1	17.9	S
Bert	9-24	—	2.2	42	Rps1	34.4	18.0	MS
IA2021	9-25	—	1.7	34	S	35.9	18.1	S
Faribault	9-26	—	2.0	36	Rps1	34.3	18.1	MS
Marcus 95	9-26	—	2.0	35	Rps1k	36.0	17.8	S
Freeborn	9-26	—	2.2	36	Rps1	36.7	17.0	MR
Hardin 91	9-27	—	2.0	41	Rps1k	35.4	18.1	MS
Granite	9-28	—	2.3	38	Rps1	36.2	17.4	MS
Sturdy	9-29	—	1.8	37	Rps1	36.2	17.2	MS

Table 7. Characteristics of publicly developed soybean varieties (1996) for southern zone. Sorted by maturity date for mid-May planting.

Note Key:

[1] Maturity date, from mid-May planting date.

[2] Maturity date, from mid-June planting date.

[3] Lodging score: 1=excellent, 5=very poor.

[4] Height expressed in inches.

[5] PR=Phytophthora resistance: Rps#-gene present, S=susceptible,

[6] Protein and oil percentages, based on 13% moisture.

[7] CR=Chlorosis rating: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible.

Variety	Maturity Date [1]	Maturity Date [2]	Lodging [3]	Height [4]	PR [5]	Protein [6]	Oil [6]	CR [7]
McCall	9-5	9-15	2.2	26	S	35.2	17.5	MR
Glacier	9-10	9-18	2.3	26	Rps6	35.6	17.8	MS
Agassiz	9-10	9-20	1.7	26	Rps1	35.7	18.1	MR
Ozzie	9-13	9-24	1.7	27	Rps1	36.2	17.2	MR
Proto	9-14	—	2.7	25	S	38.4	15.9	S
Council	9-16	—	1.8	29	Rps1	35.6	17.6	MR
Dawson	9-16	9-25	2.7	28	Rps1	35.6	17.5	MR
Evans	9-17	9-29	2.3	29	Rps1	35.4	17.9	MS
Toyopro	9-18	—	1.7	29	S	39.4	15.5	S
Lambert	9-20	9-30	2.0	29	Rps1	35.4	18.0	MR
Minnatto	9-21	—	2.0	28	Rps1	37.7	16.0	MR
Hendricks	9-22	10-1	2.5	31	Rps1	36.1	17.8	MS
Kato	9-24	10-3	2.2	32	Rps1	38.6	16.1	MS
Parker	9-26	10-3	3.0	35	Rps1	34.8	17.9	S
Faribault	9-28	10-9	2.3	33	Rps1	33.9	18.0	MS
Freeborn	9-28	—	2.5	34	Rps1	37.0	16.6	MR
Bert	9-28	10-5	3.2	35	Rps1	34.7	17.5	MS
Granite	9-29	10-10	2.3	35	Rps1	36.3	17.5	MS
IA2021	9-30	10-8	2.0	32	Rps1k	34.1	18.4	S
Hardin 91	9-30	10-9	3.0	33	Rps1	34.9	17.6	S
Sturdy	10-1	10-10	2.7	32	Rps1	35.4	17.6	MS
Archer	10-1	10-10	2.8	35	Rps1k+6	35.5	17.1	MS
Marcus 95	10-2	—	2.2	34	Rps1k	35.5	17.6	MS
IA2008	10-3	10-11	3.0	38	Rps1	34.8	16.7	MS
IA2008R	10-4	10-12	2.7	38	Rps1k	34.3	16.9	MS

Table 8A. Maturity characteristics and bushels per acre yields of public and private soybean varieties for the northern zone (1994-96; Crookston, Moorhead, Shelly).

Note Key:

[1] Relative maturity rating provided by originator. Number before decimal represents maturity group. Number after decimal represents ranking within maturity group.

[2] Date represents the number of days after August 31 that variety reaches maturity.

[3] Blend; information furnished by originator.

Variety	Company Name	Maturity [1]	Date [2]	Yield 1994-96	Yield 1995-96	Yield 1996
9004	PIONEER	00.4	14	—	40	42
MCCALL	MINN. A.E.S.	00.7	16	36	38	41
GLACIER	MINN. A.E.S.	00.8	20	39	38	40
9007	PIONEER	00.7	20	37	38	38
AGASSIZ	MINN. A.E.S.	0.0	23	42	44	45
SOO-66	NK	00.6	23	—	42	43
CX025	DEKALB	0.2	25	—	—	46
013	MYCOGEN	0.1	26	—	45	45
X6503	GCS	0.3	27	—	—	47
OZZIE	MINN. A.E.S.	0.3	27	42	42	41
KORADA	SEMENCES	0.0	28	—	46	45
3044	DYNA-GRO	0.5	28	—	41	43
X 039	GOLDEN HARVEST	0.3	28	—	—	38
TRACKER	GCS	0.5	29	45	46	45
9042	PIONEER	0.4	29	43	41	44
DSR-035	DAIRYLAND	0.3	29	42	42	43
CX046	DEKALB	0.4	29	—	42	43
UAPX206	DYNA-GRO	00.3	30	—	—	47
COUNCIL	ND A.E.S.	0.5	30	—	44	45
DAWSON	MINN. A.E.S.	0.6	30	44	44	44
3056	CIBA	0.5	30	—	41	39
9071	PIONEER	0.7	31	47	49	48
040	MYCOGEN	0.4	31	46	46	44
3036	CIBA	0.3	32	—	—	46
LAMBERT	MINN. A.E.S.	0.8	32	45	45	46
GL0735	GRT. LKS.	0.7	32	48	45	45
9606	PAYCO	0.6	32	—	—	43
DSR-068 [3]	DAIRYLAND	0.3	32	44	44	42
0653	STINE	0.3	33	50	49	48
0670	STINE	0.3	33	49	47	47
3075	CIBA	0.7	33	—	46	45
0586	STINE	0.3	33	—	—	44
EVANS	MINN. A.E.S.	0.6	33	44	44	42
PB-094	PRAIRIE BRAND	0.9	34	—	47	45
0470	STINE	0.3	34	—	—	45
700	RAMY	0.3	34	—	—	43
CX076	DEKALB	0.7	34	44	42	42
CX096	DEKALB	0.9	34	42	43	41
9508	PAYCO	0.6	35	—	—	47
PB-097	PRAIRIE BRAND	0.9	35	—	—	46

Table 8A continued. Maturity characteristics and bushels per acre yields of public and private soybean varieties for the northern zone (1994-96; Crookston, Moorhead, Shelly).

Variety	Company Name	Maturity [1]	Date [2]	Yield 1994-96	Yield 1995-96	Yield 1996
690	RAMY	0.3	35	—	—	44
DST0805	DAIRYLAND	0.3	35	—	—	43
9609	PAYCO	0.8	35	—	—	43
L0727	CENEX/LOL	0.7	35	—	—	41
LSD 0.20			112			

Table 8B. Disease resistance, protein and oil characteristics of public and private soybean varieties for the northern zone (1994-96; Crookston, Moorhead, Shelly).

Note Key:

[1] PR=Phytophthora resistance: Rps#=-gene present, S=susceptible, M=mixture of resistant and susceptible.

[2] C=Chlorosis rating: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible.

[3] Protein and oil percentages, based on 13% moisture.

[4] 2-year average.

[5] 1-year data.

[6] Blend; information furnished by originator.

Variety	PR [1]	CR [2]	Protein			Oil		
			1994-96 [3]	1995-96 [3]	1996 [3]	1994-96 [3]	1995-96 [3]	1996 [3]
9004	S	MR [4]	—	36.0	36.7	—	17.1	17.3
MCCALL	S	MR	33.5	35.6	34.8	18.2	16.7	17.3
GLACIER	Rps6	MS	33.8	35.9	35.3	18.2	16.7	17.3
9007	Rps1	MS	33.0	34.7	34.4	18.7	17.5	18.1
AGASSIZ	Rps1	MR	34.4	35.8	35.0	17.9	17.0	17.4
SOO-66	Rps1	MR [4]	—	35.1	34.2	—	17.2	18.1
CX025	Rps1	S [5]	—	—	34.1	—	—	18.0
013	Rps1	S [4]	—	35.9	34.9	—	16.9	17.6
X6503	Rps1	MS [5]	—	—	35.3	—	—	17.5
OZZIE	Rps1	MS	35.1	36.6	35.9	17.5	16.5	17.3
KORADA	S	MS [4]	—	35.9	35.2	—	17.1	17.5
3044	Rps1	MS [4]	—	35.5	35.2	—	17.3	17.8
X 039	S	S [5]	—	—	36.2	—	—	17.8
TRACKER	S	MS	34.2	34.8	34.5	17.6	17.0	17.5
9042	Rps1	MS	34.2	34.8	34.7	18.0	17.5	18.0
DSR-035	S	MS	34.8	36.7	36.2	17.8	16.5	16.8
CX046	S	MR [4]	—	36.6	35.8	—	16.0	16.8
UAPX206	M	MS [5]	—	—	33.3	—	—	18.1
COUNCIL	Rps1	MR [4]	—	34.7	34.3	—	17.3	17.8
DAWSON	Rps1	MR	32.4	34.1	33.6	18.8	17.3	17.9

Table 8B continued. Disease resistance, protein and oil characteristics of public and private soybean varieties for the northern zone (1994-96; Crookston, Moorhead, Shelly).

Variety	PR [1]	CR [2]	Protein			Oil		
			1994-96 [3]	1995-96 [3]	1996 [3]	1994-96 [3]	1995-96 [3]	1996 [3]
3056	Rps1c	MS [4]	—	36.6	35.5	—	16.1	16.4
9071	Rps1c	MS	31.6	33.3	33.1	19.3	18.1	18.6
040	Rps1c	S	32.4	33.9	33.5	18.8	17.6	18.0
3036	S	S [5]	—	—	33.8	—	—	17.8
LAMBERT	Rps1	MR	34.1	34.6	34.6	18.1	17.8	18.3
GL0735	Rps1c	MS	33.5	34.2	33.3	18.1	17.3	17.9
9606	S	S [5]	—	—	35.2	—	—	17.0
DSR-068 [6]	S	MS	34.6	36.0	35.4	17.6	16.6	17.0
0653	Rps1c	MS	34.5	34.8	33.9	17.6	17.3	17.7
0670	S	MS	33.0	34.2	34.2	18.6	17.8	18.2
3075	Rps1c	MS [4]	—	35.1	34.1	—	17.2	17.7
0586	S	MS [5]	—	—	36.4	—	—	16.6
EVANS	Rps1	MS	33.2	34.6	34.2	18.5	17.4	18.0
PB-094	M	MS [4]	—	35.1	34.4	—	17.1	17.4
0470	S	S [5]	—	—	34.3	—	—	18.0
700	Rps1c	MS [5]	—	—	33.9	—	—	17.8
CX076	S	MS	34.6	35.6	34.9	17.8	17.2	17.8
CX096	Rps1	MS	34.2	35.3	35.0	17.9	17.0	17.6
9508	M	MS [5]	—	—	33.9	—	—	17.5
PB-097	S	S [5]	—	—	34.0	—	—	17.9
690	Rps1	S [5]	—	—	33.9	—	—	17.8
DST0805	Rps1c	MS [5]	—	—	32.7	—	—	18.4
9609	S	MS [5]	—	—	33.9	—	—	18.6
L0727	Rps1k	MS [5]	—	—	35.5	—	—	17.1

Table 9A. Maturity characteristics and bushels per acre yields of public and private soybean varieties for the central zone (1994-96; Becker, Morris, Rosemount).

Note Key:

[1] Relative maturity rating provided by originator. Number before decimal represents maturity group. Number after decimal represents ranking within maturity group.

[2] Date represents the number of days after August 31 that variety reaches maturity.

Variety	Company Name	Maturity [1]	Date [2]	Yield 1994-96	Yield 1995-96	Yield 1996
OZZIE	MINN. A.E.S.	0.3	16	44	44	44
DAWSON	MINN. A.E.S.	0.6	17	45	45	40
COUNCIL	ND A.E.S.	0.5	18	—	47	44
EVANS	MINN. A.E.S.	0.6	18	45	44	38
LAMBERT	MINN. A.E.S.	0.8	19	52	51	47

Table 9A continued. Maturity characteristics and bushels per acre yields of public and private soybean varieties for the central zone (1994-96; Becker, Morris, Rosemount).

Variety	Company Name	Maturity [1]	Date [2]	Yield 1994-96	Yield 1995-96	Yield 1996
9071	PIONEER	0.7	19	—	52	47
0010	PAYCO	1.0	19	47	47	43
M-0995	MUSTANG	0.9	20	—	50	47
1073	STINE	1.0	20	—	—	47
EX-150	LATHAM	1.3	20	—	—	46
PB-104	PBR	1.0	20	—	50	46
3106	CIBA	1.0	20	—	—	46
84	PROFISEED	1.0	20	—	—	45
9610	PAYCO	1.0	20	—	51	45
UAPX194	DYNA-GRO	1.0	20	—	—	44
H-1082	GOLDEN HARVEST	0.8	20	—	48	43
H-1078	GOLDEN HARVEST	0.8	20	49	47	43
HENDRICKS	MINN. A.E.S.	0.9	20	48	47	42
D138	ICI	1.3	21	54	52	48
3103	CIBA	1.0	21	53	51	48
GOODWIN	GCS	1.2	21	51	50	48
3096	CIBA	0.9	21	—	51	47
111	MYCOGEN	1.1	21	—	50	47
E084	TERRA	0.8	21	—	49	47
EXP 14831	ZILLER	1.0	21	—	—	46
RS0995	RENK	0.9	21	—	—	46
9091	PIONEER	0.9	21	49	48	46
990	RAMY	0.9	21	—	—	45
CX145	DEKALB	1.4	21	—	51	45
5100	MYCOGEN	1.0	21	—	—	44
9132	PIONEER	1.3	21	—	48	43
CX096	DEKALB	0.9	21	48	46	42
5091	MYCOGEN	0.9	21	—	—	41
K-0909+	KRUGER	0.7	22	—	—	48
UAPX195	DYNA-GRO	1.0	22	—	—	48
PB-097	PBR	0.9	22	—	—	47
JULIUS	DAHLMAN	0.9	22	—	—	47
D111	ICI	1.1	22	52	52	46
S08-80	NK	0.8	22	—	—	46
AP 1394	AGRIPRO	1.3	22	—	51	45
DSR-133	DAIRYLAND	1.3	22	51	51	45
EXP1305	DAHLMAN	1.3	22	—	—	44
M-0998	MUSTANG	0.9	22	—	—	44
TS093	TERRA	0.9	22	—	47	41
9151	PIONEER	1.5	23	—	52	47
G1400	MSG	1.4	23	—	53	47
3120	DYNA-GRO	1.2	23	—	—	47
S12-49	NK	1.3	23	—	51	47
CX121	DEKALB	1.2	23	52	50	45
RAYDOR	GCS	1.0	23	—	—	41

Table 9A continued. Maturity characteristics and bushels per acre yields of public and private soybean varieties for the central zone (1994-96; Becker, Morris, Rosemount).

Variety	Company Name	Maturity [1]	Date [2]	Yield 1994-96	Yield 1995-96	Yield 1996
KATO	MINN. A.E.S.	1.3	23	46	45	41
9514	PAYCO	1.4	24	—	—	49
EXP 165	SANDS	1.5	24	—	52	46
K-0999	KRUGER	0.7	24	54	51	44
3144	CIBA	1.4	24	49	47	44
L1499	CENEX/LOL	1.4	25	—	—	51
M-1133	MUSTANG	1.3	25	—	53	49
5143	MYCOGEN	1.4	25	—	—	47
RS1493	RENK	1.4	25	—	—	46
EXP 15134	ZILLER	1.4	25	—	—	46
T-3162	THOMPSON	1.4	25	—	—	43
170 BRAND	LATHAM	1.3	25	48	46	43
DSR-173	DAIRYLAND	1.5	26	51	51	46
PARKER	MINN. A.E.S.	1.5	26	50	50	46
KANDI	GCS	1.4	26	—	—	45
H-1140	GOLDEN HARVEST	1.4	26	52	48	43
PBR-127	PBR	1.2	27	—	53	49
KB145	KALTENBERG	1.4	27	—	53	46
K-1313+	YIELD KING	1.1	28	—	—	50
M-1144	MUSTANG	1.4	28	—	—	48
G-1610	MSG	1.6	28	—	—	47
K-1414+	YIELD KING	1.2	28	—	—	47
EXP 9614	SANDS	1.4	28	—	—	47
EXP1529	DAHLMAN	1.5	28	—	—	44
BERT	MINN. A.E.S.	1.8	28	49	49	44
DST1221	DAIRYLAND	1.5	28	—	—	43
PB-166	PBR	1.5	28	—	—	42
SOI 177	SANDS	1.4	29	—	—	51
PBR-143X	PBR	1.4	29	—	—	48
1470	STINE	1.4	29	54	51	47
LG6145	LG SEEDS	1.4	29	—	—	46
DST1220	DAIRYLAND	1.5	29	—	—	46
T-3172	THOMPSON	1.5	29	—	52	46
HIGHLAND	GCS	1.7	29	—	49	43
1134	HY-VIGOR	1.0	29	—	—	43
T-3184	THOMPSON	1.5	29	—	—	43
SOI 260	SANDS	1.5	30	58	56	52
IA1006	IOWA A.E.S.	1.6	30	—	—	49
K-1777	KSC/CHALLENGER	1.4	30	—	—	48
3152	DYNA-GRO	1.6	30	—	—	47
K-1929	KSC/CHALLENGER	1.5	30	—	—	47
GL1559	GRT. LKS.	1.5	30	—	—	43
K-1819	YIELD KING	1.5	31	58	56	50
K-1990	KRUGER	1.5	31	—	55	50
K-1909	KRUGER	1.5	31	55	53	49

Table 9A continued. Maturity characteristics and bushels per acre yields of public and private soybean varieties for the central zone (1994-96; Becker, Morris, Rosemount).

Variety	Company Name	Maturity [1]	Date [2]	Yield 1994-96	Yield 1995-96	Yield 1996
1800	RAMY	1.5	31	—	—	47
PBR-154X	PBR	1.5	31	—	52	47
EX-220	LATHAM	1.6	31	—	—	46
K-2025	YIELD KING	1.5	31	54	53	46
PB-167	PBR	1.5	31	—	—	45
FREEBORN	MINN. A.E.S.	1.6	31	—	46	42
2002	HY-VIGOR	1.5	31	—	46	39
1980	STINE	1.5	32	—	—	49
1570	STINE	1.5	32	—	—	49
K-2022	KSC/CHALLENGER	1.5	32	—	—	46
1990	RAMY	1.5	32	—	—	45
EX2034	THOMPSON	1.5	32	—	—	44
PBR-169X	PBR	1.5	33	—	—	50
1580	STINE	1.5	33	—	52	47
2000	RAMY	1.5	33	—	—	45
K-1777+	KSC/CHALLENGER	1.4	33	—	—	43
GRANITE	MINN. A.E.S.	1.8	33	—	47	43
2002	RAMY	1.5	33	—	—	45
LSD 0.20				1	1	2

Table 9B. Disease resistance, protein and oil characteristics of public and private soybean varieties for the central zone (1994-96; Becker, Morris, Rosemount).

Note Key:

[1] PR=Phytophthora resistance: Rps#=gene present, S=susceptible, M=mixture of resistant and susceptible.

[2] CR=Chlorosis rating: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible.

[3] Protein and oil percentages, based on 13% moisture.

[4] 2-year average.

[5] 1-year data.

Variety	PR [1]	CR [2]	Protein			Oil		
			1994-96 [3]	1995-96 [3]	1996 [3]	1994-96 [3]	1995-96 [3]	1996 [3]
OZZIE	Rps1	MS	37.1	37.6	36.4	16.5	16.0	17.2
DAWSON	Rps1	MR	35.2	35.6	34.4	17.6	17.2	18.1
COUNCIL	Rps1	MR	—	35.4	34.5	—	17.2	18.1
EVANS	Rps1	MS	35.6	35.9	35.0	17.5	17.2	18.2
LAMBERT	Rps1	MR	36.0	36.3	35.6	17.4	17.3	18.6
9071	Rps1c	MS [4]	—	34.8	33.8	—	17.7	18.4
0010	Rps1	MR	36.5	36.9	35.5	16.7	16.4	17.5
M-0995	S	MS [4]	—	35.5	34.3	—	17.6	18.5
1073	S	S [5]	—	—	34.4	—	—	18.4
EX-150	S	S [5]	—	—	34.4	—	—	18.3

Table 9B continued. Disease resistance, protein and oil characteristics of public and private soybean varieties for the central zone (1994-96; Becker, Morris, Rosemount).

Variety	PR [1]	CR [2]	Protein			Oil		
			1994-96 [3]	1995-96 [3]	1996 [3]	1994-96 [3]	1995-96 [3]	1996 [3]
PB-104	S	MS [4]	—	35.5	34.5	—	17.6	18.5
3106	S	S [5]	—	—	34.2	—	—	18.4
84	S	S [5]	—	—	33.8	—	—	18.5
9610	S	MS [4]	—	35.9	34.7	—	17.3	18.0
UAPX194	S	S [5]	—	—	33.5	—	—	18.4
H-1082	M	MS [4]	—	36.0	34.8	—	17.4	18.3
H-1078	Rps1	MR	34.9	35.3	34.5	17.7	17.2	17.9
HENDRICKS	Rps1	MS	35.7	36.2	35.9	17.6	17.2	17.9
D138	S	MS	36.9	37.2	36.3	16.9	16.8	17.9
3103	S	MS	36.7	37.2	35.5	16.8	16.5	17.6
GOODWIN	Rps1k	S	34.4	34.7	34.1	18.0	17.5	18.3
3096	S	MS [4]	—	35.2	34.3	—	17.7	18.4
111	Rps1	MS [4]	—	34.6	33.5	—	17.4	18.4
E084	Rps1c	MS [4]	—	35.8	34.5	—	17.2	18.1
EXP 14831	S	MS [5]	—	—	34.2	—	—	18.2
RS0995	S	MS [5]	—	—	34.5	—	—	18.6
9091	S	MS	35.9	36.4	35.9	17.2	16.8	17.3
990	S	MR [5]	—	—	34.7	—	—	18.1
CX145	S	S [4]	—	37.0	35.7	—	17.0	17.9
5100	S	MS [5]	—	—	35.4	—	—	18.3
9132	Rps1c	MS [4]	—	35.4	34.7	—	17.5	18.3
CX096	Rps1	MS	36.4	36.8	35.3	16.8	16.4	17.5
5091	S	MS [5]	—	—	34.8	—	—	18
K-0909+	S	S [5]	—	—	34.6	—	—	17.7
UAPX195	S	S [5]	—	—	35.6	—	—	17.8
PB-097	S	S [5]	—	—	34.7	—	—	18.4
JULIUS	S	S [5]	—	—	34.6	—	—	18.0
D111	Rps1	MS	35.0	35.6	34.7	18.0	17.5	18.7
S08-80	Rps1c	S [5]	—	—	35.1	—	—	18.0
AP 1394	Rps1c	MS [4]	—	36.3	35.6	—	17.1	17.6
DSR-133	Rps1	MS	34.9	35.1	33.8	17.5	17.1	18.0
EXP1305	Rps1c	MR [5]	—	—	35.3	—	—	18
M-0998	S	MS [5]	—	—	35.1	—	—	18.4
TS093	Rps1	MS [4]	—	35.7	35.3	—	17.3	18.0
9151	Rps1k	MS [4]	—	36.3	35.4	—	17.0	18.0
G1400	S	MS [4]	—	37.3	35.6	—	16.2	17.2
3120	S	S [5]	—	—	35.6	—	—	18.0
S12-49	Rps1c	S [4]	—	36.2	35.3	—	16.9	17.8
CX121	Rps1	MS	35.1	35.8	35.9	17.7	17.1	17.7
RAYDOR	Rps6	MR [5]	—	—	34.7	—	—	17.9
KATO	Rps1	MS	38.9	39.0	39.1	15.9	16.2	16.4
9514	S	MS [5]	—	—	36.1	—	—	17.2
EXP 165	Rps1k	MS [4]	—	36.5	35.3	—	17.1	18.2
K-0999	S	S	34.6	35.2	34.3	18.0	17.4	18.1
3144	S	MR	35.8	35.9	34.5	17.3	17.1	18.1

Table 9B continued. Disease resistance, protein and oil characteristics of public and private soybean varieties for the central zone (1994-96; Becker, Morris, Rosemount).

Variety	PR [1]	CR [2]	Protein			Oil		
			1994-96 [3]	1995-96 [3]	1996 [3]	1994-96 [3]	1995-96 [3]	1996 [3]
L1499	Rps1k	S [5]	—	—	36.3	—	—	18.2
M-1133	Rps1	S [4]	—	37.0	36.0	—	16.9	18.3
5143	S	S [5]	—	—	34.4	—	—	19.0
RS1493	Rps1k	MS [5]	—	—	36.9	—	—	17.5
EXP 15134	S	MS [5]	—	—	36.6	—	—	17.2
T-3162	S	MS [5]	—	—	34.9	—	—	17.5
170 BRAND	S	MR	35.6	36.1	34.8	17.4	17.1	17.8
DSR-173	Rps1	S	36.6	36.9	36.1	17.1	16.9	17.6
PARKER	Rps1	S	34.8	35.1	33.8	17.9	17.6	18.6
KANDI	Rps1k	S [5]	—	—	37.1	—	—	17.6
H-1140	Rps1k	S	37.8	37.9	37.4	16.6	16.6	17.4
PBR-127	S	MS [4]	—	36.2	35.4	—	17.2	18.2
KB145	Rps1	MS [4]	—	36.4	35.1	—	17.0	18.3
K-1313+	Rps1	S [5]	—	—	35.1	—	—	17.9
M-1144	S	MS [5]	—	—	34.8	—	—	18.4
G-1610	S	MS [5]	—	—	35.1	—	—	17.5
K-1414+	S	MS [5]	—	—	35.6	—	—	17.3
EXP 9614	Rps1	MS [5]	—	—	35.4	—	—	18.0
EXP1529	S	MS [5]	—	—	35.3	—	—	17.2
BERT	Rps1	MS	33.8	34.5	34.1	18.0	17.3	18.2
DST1221	Rps1c	S [5]	—	—	36.0	—	—	17.8
PB-166	S	S [5]	—	—	36.0	—	—	17.6
SOI 177	S	MS [5]	—	—	35.9	—	—	17.3
PBR-143X	S	S [5]	—	—	36.2	—	—	16.9
1470	S	MS	36.7	37.1	36.3	16.9	16.6	17.6
LG6145	Rps1	MS [5]	—	—	35.1	—	—	18.3
DST1220	S	S [5]	—	—	35.8	—	—	17.5
T-3172	S	MS [4]	—	35.3	33.5	—	17.4	18.7
HIGHLAND	S	S [4]	—	37.1	37.0	—	16.1	16.2
1134	S	MS [5]	—	—	34.0	—	—	18.2
T-3184	Rps1	S [5]	—	—	34.8	—	—	17.3
SOI 260	S	S	35.6	35.8	35.4	17.4	17.1	18.0
IA1006	S	S [5]	—	—	34.3	—	—	18.4
K-1777	S	S [5]	—	—	36.8	—	—	16.9
3152	S	MS [5]	—	—	35.3	—	—	17.7
K-1929	S	MS [5]	—	—	34.2	—	—	18.8
GL1559	Rps1	S [5]	—	—	38.9	—	—	16.6
K-1819	S	MS	36.1	36.0	35.3	17.1	17.2	17.9
K-1990	S	S [4]	—	36.5	36.1	—	16.6	17.6
K-1909	Rps1k	MS	36.3	36.6	35.7	16.9	16.6	17.6
1800	S	S [5]	—	—	34.7	—	—	18.9
PBR-154X	S	MS [4]	—	35.9	35.5	—	17.2	17.8
EX-220	S	S [5]	—	—	35.8	—	—	17.4
K-2025	S	S	35.8	35.8	35.7	17.2	17.1	17.8
PB-167	S	S [5]	—	—	36.6	—	—	16.9

Table 9B continued. Disease resistance, protein and oil characteristics of public and private soybean varieties for the central zone (1994-96; Becker, Morris, Rosemount).

Variety	PR [1]	CR [2]	Protein			Oil		
			1994-96 [3]	1995-96 [3]	1996 [3]	1994-96 [3]	1995-96 [3]	1996 [3]
FREEBORN	Rps1	MR [4]	—	37.5	37.1	—	16.4	17.3
2002	Rps1	MR [4]	—	35.6	34.6	—	16.7	17.8
1980	S	MS [5]	—	—	35.9	—	—	17.9
1570	S	S [5]	—	—	35.6	—	—	17.8
K-2022	S	MS [5]	—	—	36.7	—	—	17.5
1990	S	S [5]	—	—	36.5	—	—	17.6
EX2034	S	S [5]	—	—	36.2	—	—	17.6
PBR-169X	S	MS [5]	—	—	35.4	—	—	18.0
1580	S	S [4]	—	35.4	35.1	—	17.8	18.5
2000	S	MS [5]	—	—	35.5	—	—	18.1
K-1777+	S	MS [5]	—	—	35.1	—	—	18.3
GRANITE	Rps1	MS [4]	—	36.3	35.5	—	16.7	17.9
2002	Rps1	MR [4]	—	—	35.6	—	16.7	17.8

Table 10A. Maturity characteristics and bushels per acre yields of public and private soybean varieties for the southern zone (1994-96; Fairmont, Lamberton, Waseca).

Note Key:

[1] Relative maturity rating provided by originator. Number before decimal represents maturity group. Number after decimal represents ranking within maturity group.

[2] Date represents the number of days after August 31 that variety reaches maturity.

[3] Blend; information furnished by originator.

Variety	Company Name	Maturity [1]	Date [2]	Yield 1994-96	Yield 1995-96	Yield 1996
KATO	MINN. A.E.S.	1.3	24	49	49	46
PARKER	MINN. A.E.S.	1.5	25	54	52	49
5181	MYCOGEN	1.8	27	—	—	51
1470	STINE	1.4	27	—	55	51
9163	PIONEER	1.6	27	—	54	49
9172	PIONEER	1.7	27	—	55	49
CX173	DEKALB	1.7	27	—	53	48
AP1953	AGRIPRO	1.9	28	—	—	55
WILTON	DAHLMAN	1.7	28	—	—	53
1796	VIKING	1.7	28	—	—	51
RS1795	RENK	1.7	28	—	—	50
MCLEOD	GCS	1.8	28	—	—	48
BERT	MINN. A.E.S.	1.8	28	50	48	42
FREEBORN	MINN. A.E.S.	1.6	28	—	46	41
D180	ICI	1.8	29	—	—	54

Table 10A continued. Maturity characteristics and bushels per acre yields of public and private soybean varieties for the southern zone (1994-96; Fairmont, Lamberton, Waseca).

Variety	Company Name	Maturity [1]	Date [2]	Yield 1994-96	Yield 1995-96	Yield 1996
EXP 9618	STAR	1.8	29	—	—	53
M-1160	MUSTANG	1.6	29	—	—	52
TS174	TERRA	1.7	29	—	58	52
K-2029	YIELD KING	1.8	29	—	—	51
D190	ICI	1.9	29	54	54	51
M-1175	MUSTANG	1.7	29	—	56	50
HARDIN 91	IOWA A.E.S.	2.0	29	52	51	47
FARIBAULT	MINN. A.E.S.	1.9	29	49	46	43
SOI 260	SANDS	1.9	30	—	61	57
250 BRAND	LATHAM	1.9	30	—	—	57
TS194	TERRA	1.9	30	60	59	56
G-1885	MSG	1.8	30	—	—	55
EX-560	LATHAM	2.2	30	—	—	54
200	MYCOGEN	2.1	30	—	58	54
9419	PAYCO	1.9	30	60	59	53
RS1994	RENK	1.9	30	—	—	53
EX1981	THOMPSON	1.9	30	—	—	53
CX197	DEKALB	1.9	30	—	—	52
ODIN	GCS	1.9	30	—	57	52
1690	STINE	1.9	30	—	55	51
D213	ICI	2.1	30	56	55	50
IA2021	IOWA A.E.S.	2.1	30	—	56	50
OLAF	DAHLMAN	2.1	30	—	—	50
T-3188 [3]	THOMPSON	1.8	30	—	—	50
3196	CIBA	1.9	30	—	—	49
GRANITE	MINN. A.E.S.	1.8	30	—	52	49
DSR-178	DAIRYLAND	1.7	30	—	—	49
410 BRAND	LATHAM	1.9	31	—	60	55
PB-212E	PRAIRIE BRAND	2.0	31	60	58	54
1980	STINE	1.5	31	—	—	54
9620	PAYCO	2.0	31	—	—	54
GL 1872	GRT. LKS.	1.8	31	—	—	54
EXP 16528	ZILLER	1.8	31	—	—	54
EXP 9619	STAR	1.9	31	—	—	54
J669	JACOBSEN	1.9	31	—	—	54
K-2022	YIELD KING	1.8	31	—	—	54
M-1197	MUSTANG	1.9	31	—	—	54
2057 [3]	PROFISEED	1.9	31	—	—	54
H-1194	GOLDEN HARVEST	1.9	31	—	59	53
S-239	SANSGAARD	2.3	31	—	—	53
CX232	DEKALB	2.3	31	60	58	53
1995	RAMY	1.9	31	—	59	53
390 BRAND	LATHAM	1.9	31	59	56	53
K-1990	KSC/CHALLENGER	1.6	31	—	—	53
2224	PROFISEED	2.1	31	—	58	52

Table 10A continued. Maturity characteristics and bushels per acre yields of public and private soybean varieties for the southern zone (1994-96; Fairmont, Lamberton, Waseca).

Variety	Company Name	Maturity [1]	Date [2]	Yield 1994-96	Yield 1995-96	Yield 1996
3195	DYNA-GRO	1.9	31	—	—	52
DSR-195	DAIRYLAND	1.9	31	—	—	52
SPRINGFIELD	GCS	2.0	31	—	—	52
T-3212	THOMPSON	2.1	31	—	—	52
480 BRAND	LATHAM	1.9	31	—	56	51
MARCUS 95	IOWA A.E.S.	2.3	31	—	53	51
9204	PIONEER	2.0	31	58	54	51
H-1218	GCS	2.1	31	—	57	51
S-214E	SANSGAARD	2.0	31	60	58	51
1580	STINE	1.5	31	—	—	50
STURDY	MINN. A.E.S.	2.1	32	54	51	46
PB-197	PRAIRIE BRAND	1.9	32	63	63	58
PBR-202	PBR	2.0	32	—	—	57
2000	PROFISEED	2.0	32	—	60	57
SOI 169	SANDS	2.0	32	64	63	57
M-2200	MUSTANG	2.0	32	—	61	56
1970	STINE	1.9	32	—	—	56
9233	PIONEER	2.3	32	—	—	55
J750	JACOBSEN	2.0	32	—	61	55
TS200	TERRA	2.0	32	—	—	55
EX-392	LATHAM	2.0	32	—	—	55
K-2343	KSC/CHALLENGER	2.0	32	—	61	55
PBR-217	PBR	2.1	32	—	58	55
2195	RAMY	2.1	32	—	—	54
9623	PAYCO	2.3	32	—	—	54
K-2343+	KRUGER	2.1	32	—	—	54
G-1912	MSG	1.9	32	—	—	54
S20-91	NK	2.1	32	—	56	54
RS2394	RENK	2.3	32	—	—	53
G2440	MSG	2.4	32	61	59	53
J742	JACOBSEN	2.2	32	—	58	53
TS210	TERRA	2.1	32	—	58	53
AP2220	AGRIPRO	2.2	32	—	—	53
K-2162+	KSC/CHALLENGER	1.8	32	—	—	53
S-187	SANSGAARD	1.8	32	—	57	53
EX2001	THOMPSON	2.0	32	—	—	53
T-3190	THOMPSON	2.0	32	58	57	52
PB-201	PRAIRIE BRAND	2.0	32	60	59	52
S23-06	NK	2.3	32	—	—	52
KB184	KALTENBERG	1.8	32	60	58	52
SOI 252	SANDS	2.1	32	58	57	52
EX2018	THOMPSON	1.9	32	—	—	52
E-298	EHRICH	2.2	32	59	56	52
PBR-192	PBR	1.9	32	—	—	52
5205	MYCOGEN	2.0	32	—	—	51

Table 10A continued. Maturity characteristics and bushels per acre yields of public and private soybean varieties for the southern zone (1994-96; Fairmont, Lamberton, Waseca).

Variety	Company Name	Maturity [1]	Date [2]	Yield 1994-96	Yield 1995-96	Yield 1996
GL2045	GRT. LKS	2.0	32	—	54	51
RS1896	RENK	1.8	32	—	—	51
SOI 261	SANDS	1.9	32	—	—	49
ARCHER	IOWAA.E.S.	1.9	32	53	52	49
H-1228	GOLDEN HARVEST	2.2	32	55	53	46
660 BRAND	LATHAM	2.4	33	63	61	57
REDWOOD	GCS	2.1	33	—	—	56
D260	ICI	2.5	33	—	61	55
2220	RAMY	2.2	33	—	61	55
K-2525+	YIELD KING	2.3	33	—	—	55
2560	STINE	2.4	33	—	—	54
CX229	DEKALB	2.2	33	—	—	54
J-251	MYCOGEN	2.4	33	61	58	54
K-2625	KRUGER	2.4	33	—	60	53
J865	JACOBSEN	2.4	33	—	—	53
IA2008	IOWAA.E.S.	2.2	33	58	57	53
LG6212	LG SEEDS	2.1	33	—	—	52
2050	HY-VIGOR	2.2	33	59	57	52
KB246	KALTENBERG	2.4	33	—	—	52
G2100	MSG	2.1	33	—	57	52
S-236	SANSGAARD	2.5	33	—	56	51
590 BRAND	LATHAM	2.2	33	58	57	51
2350	HY-VIGOR	2.3	33	—	—	50
3215	CIBA	2.1	33	—	55	49
2395	RAMY	2.3	33	—	—	48
3256	DYNA-GRO	2.2	34	—	—	56
EXP 9624	STAR	2.4	34	—	—	54
2556	PROFISEED	2.4	34	—	—	54
GL2415	GRT. LKS.	2.4	34	60	58	54
T-3227 [3]	THOMPSON	2.3	34	—	57	54
PB-2120	PRAIRIE BRAND	2.3	34	60	59	53
L2494	CENEX/LOL	2.0	34	—	57	53
K-2220	KRUGER	2.0	34	—	—	53
9625	PAYCO	2.4	34	—	—	52
K-2323+	YIELD KING	2.1	34	61	58	52
2621	STINE	2.2	34	57	56	51
PBR-246	PBR	2.4	34	—	—	51
DG 3210	DYNA-GRO	2.1	34	—	56	50
DSR-220/STS	DAIRYLAND	2.2	34	—	52	49
EXP 9622	STAR	2.2	34	—	—	48
DSR-246/STS	DAIRYLAND	2.4	34	—	—	47
IA2008R	IOWAA.E.S.	2.1	35	—	54	49
EX2025	THOMPSON	2.4	35	—	—	49
2196	VIKING	2.1	35	—	—	46
K-2595	KSC/CHALLENGER	2.2	36	—	—	44
IA2022	IOWAA.E.S.	2.5	37	—	—	46
K-2111	KRUGER	1.9	38	—	—	48
LSD 0.20				1	1	2

Table 10B. Disease resistance, protein and oil characteristics of public and private soybean varieties for the southern zone (1994-96; Fairmont, Lamberton, Waseca).

Note Key:

[1] PR=Phytophthora resistance: Rps#=gene present, S=susceptible, M=mixture of resistant and susceptible.

[2] CR=Chlorosis rating: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible.

[3] Protein and oil percentages, based on 13% moisture.

[4] Blend; information furnished by originator.

[5] 1-year data.

[6] 2-year average.

Variety	PR [1]	CR [2]	Protein			Oil		
			1994-96 [3]	1995-96 [3]	1996 [3]	1994-96 [3]	1995-96 [3]	1996 [3]
KATO	Rps1	MS	38.1	39.3	38.8	16.5	16.2	16.4
PARKER	Rps1	S	35.3	36.4	35.3	17.6	16.9	17.8
5181	S	MS [6]	—	—	34.5	—	—	17.4
1470	S	MR [5]	—	36.4	35.4	—	16.9	17.4
9163	Rps1c	MR [5]	—	34.9	33.9	—	17.6	18.0
9172	Rps1k	S [5]	—	36.1	35.5	—	16.6	17.2
CX173	Rps1c	MS [5]	—	34.7	33.8	—	17.0	17.7
AP 1953	Rps1k	MS [6]	—	—	33.2	—	—	18.0
WILTON	S	MS [6]	—	—	35.0	—	—	16.7
1796	S	MR [6]	—	—	35.0	—	—	16.9
RS1795	S	S [6]	—	—	34.7	—	—	16.8
MCLEOD	Rps1c	MS [6]	—	—	36.3	—	—	17.5
BERT	Rps1	MS	34.3	35.5	34.9	18.0	17.2	17.6
FREEBORN	Rps1	MR [5]	—	37.5	36.5	—	16.2	17.1
D180	S	MS [6]	—	—	35.8	—	—	17.9
EXP 9618	S	S [6]	—	—	34.9	—	—	17.5
M-1160	S	S [6]	—	—	35.5	—	—	17.2
TS174	S	S [5]	—	36.6	35.3	—	16.4	17.3
K-2029	S	S [6]	—	—	35.3	—	—	17.5
D190	S	S	35.7	37.0	35.1	17.0	16.1	17.5
M-1175	S	MS [5]	—	36.7	35.9	—	16.6	17.6
HARDIN 91	Rps1k	S	35.6	36.5	36.6	17.6	17.1	17.7
FARIBAULT	Rps1	MS	34.0	34.1	33.9	18.0	17.6	18.0
SOI 260	S	S [5]	—	36.2	35.5	—	17.0	17.6
250 BRAND	S	S [6]	—	—	35.4	—	—	17.3
TS194	S	S	35.5	36.6	35.5	17.3	16.6	17.6
G-1885	S	S [6]	—	—	35.7	—	—	17.6
EX-560	S	S [6]	—	—	35.2	—	—	17.3
200	S	MS [5]	—	35.5	35.2	—	17.2	17.8
9419	S	S	35.5	36.5	35.6	17.6	17.2	18.0
RS1994	Rps1	S [6]	—	—	35.3	—	—	17.4
EX1981	S	S [6]	—	—	35.6	—	—	17.0
CX197	Rps1k	MS [5]	—	—	35.5	—	—	17.4
ODIN	S	S [5]	—	35.9	35.7	—	16.8	17.2
1690	S	MS [5]	—	35.3	35.1	—	17.1	17.4

Table 10B continued. Disease resistance, protein and oil characteristics of public and private soybean varieties for the southern zone (1994-96; Fairmont, Lamberton, Waseca).

Variety	PR [1]	CR [2]	Protein			Oil		
			1994-96 [3]	1995-96 [3]	1996 [3]	1994-96 [3]	1995-96 [3]	1996 [3]
D213	Rps1	MS	34.8	35.7	35.0	17.8	17.3	17.5
IA2021	Rps1k	S [5]	—	34.3	34.4	—	18.0	18.4
OLAF	S	MS [6]	—	—	35.2	—	—	17.8
T-3188 [4]	S	S [6]	—	—	35.1	—	—	17.3
3196	S	S [6]	—	—	36.1	—	—	17.2
GRANITE	Rps1	MS [5]	—	36.6	36.0	—	16.5	17.3
DSR-178	Rps1c	S [6]	—	—	35.7	—	—	17.5
410 BRAND	S	S [5]	—	35.6	35.3	—	17.5	17.9
PB-212E	S	S	34.7	35.6	35.4	18.1	17.7	17.9
1980	S	MS [6]	—	—	35.5	—	—	17.4
9620	S	MS [6]	—	—	35.0	—	—	17.5
GL 1872	S	S [6]	—	—	35.8	—	—	17.8
EXP 16528	S	MS [6]	—	—	35.1	—	—	17.4
EXP 9619	Rps1c	MR [6]	—	—	34.5	—	—	17.3
J669	S	S [6]	—	—	36.3	—	—	17.2
K-2022	S	MS [6]	—	—	35.7	—	—	17.4
M-1197	S	MS [6]	—	—	36.1	—	—	17.2
2057 [4]	S	S [6]	—	—	36.3	—	—	17.3
H-1194	S	MS [5]	—	35.1	35.1	—	17.5	18.2
S-239	S	S [6]	—	—	36.4	—	—	16.5
CX232	S	S	35.6	36.5	35.7	17.7	17.3	17.9
1995	S	S [5]	—	35.4	35.0	—	17.0	17.3
390 BRAND	S	MS	35.2	36.0	34.9	17.5	16.9	17.0
K-1990	S	S [6]	—	—	35.6	—	—	17.9
2224	S	MS [5]	—	33.7	34.3	—	17.6	18.2
3195	S	MS [6]	—	—	34.6	—	—	17.2
DSR-195	S	MS [6]	—	—	35.3	—	—	17.3
SPRINGFIELD	Rps1k	MS [6]	—	—	34.8	—	—	17.1
T-3212	S	S [6]	—	—	36.8	—	—	16.6
480 BRAND	S	S [5]	—	35.2	35.2	—	17.5	17.8
MARCUS 95	Rps1k+6	MS [5]	—	35.3	34.7	—	17.3	17.8
9204	Rps1	S	35.0	36.0	35.3	17.4	16.7	17.1
H-1218	S	MS [5]	—	35.8	34.7	—	16.5	17.2
S-214E	S	MS	34.3	35.1	34.7	17.9	17.2	17.8
1580	S	S [6]	—	—	34.6	—	—	17.7
STURDY	Rps1	MS	35.5	36.4	36.1	17.4	16.8	17.0
PB-197	S	MS	35.5	36.4	35.5	17.3	16.8	17.0
PBR-202	S	MS [6]	—	—	35.5	—	—	17.3
2000	S	MS [5]	—	36.2	35.6	—	16.9	17.1
SOI 169	S	MS	35.4	36.0	35.1	17.2	16.6	16.8
M-2200	S	MS [5]	—	36.1	35.3	—	16.7	17.1
1970	S	MS [6]	—	—	35.1	—	—	17.3
9233	S	MS [6]	—	—	35.2	—	—	17.1
J750	S	MS [5]	—	36.0	35.4	—	17.1	17.4
TS200	S	S [6]	—	—	35.2	—	—	17.4

Table 10B continued. Disease resistance, protein and oil characteristics of public and private soybean varieties for the southern zone (1994-96; Fairmont, Lamberton, Waseca).

Variety	PR [1]	CR [2]	Protein			Oil		
			1994-96 [3]	1995-96 [3]	1996 [3]	1994-96 [3]	1995-96 [3]	1996 [3]
EX-392	S	MR [6]	—	—	35.6	—	—	17.2
K-2343	S	S [5]	—	36.1	35.6	—	16.8	17.0
PBR-217	S	MS [5]	—	36.0	34.9	—	16.9	17.6
2195	S	MS [6]	—	—	35.1	—	—	17.2
9623	S	MR [6]	—	—	35.5	—	—	17.2
K-2343+	S	S [6]	—	—	35.3	—	—	16.8
G-1912	Rps1c	MS [6]	—	—	34.8	—	—	17.3
S20-91	Rps1c	MS [5]	—	36.7	36.0	—	16.8	17.5
RS2394	Rps1	S [6]	—	—	34.5	—	—	17.8
G2440	S	MS	35.2	36.0	35.5	17.5	17.0	17.5
J742	S	MS [5]	—	35.7	35.6	—	17.0	17.5
TS210	S	MS [5]	—	37.1	36.6	—	16.4	16.9
AP 2220	S	MS [6]	—	—	35.8	—	—	17.2
K-2162+	S	MR [6]	—	—	35.2	—	—	17.6
S-187	S	S [5]	—	37.0	35.9	—	16.5	17.2
EX2001	S	S [6]	—	—	35.2	—	—	17.0
T-3190	S	S	35.9	36.6	35.7	16.9	16.4	16.9
PB-201	S	MS	36.3	37.0	36.3	16.9	16.6	17.3
S23-06	Rps1c	MS [6]	—	—	36.0	—	—	17.5
KB184	S	S	35.5	36.5	36.0	17.6	17.1	17.7
SOI 252	S	MR	36.2	37.1	36.3	16.9	16.4	17.0
EX2018	S	MR [6]	—	—	34.5	—	—	16.7
E-298	S	MS	35.4	36.3	35.3	17.4	16.8	17.3
PBR-192	Rps1c	MS [6]	—	—	34.5	—	—	17.1
5205	S	S [6]	—	—	36.8	—	—	16.4
GL2045	S	MR [5]	—	37.5	36.8	—	16.3	17.2
RS1896	S	S [6]	—	—	35.5	—	—	17.7
SOI 261	S	MS [6]	—	—	34.7	—	—	17.9
ARCHER	Rps1k+6	MS	34.9	35.8	35.0	17.5	16.7	17.4
H-1228	Rps1	MS	34.1	34.9	34.9	18.0	17.3	17.4
660 BRAND	S	S	35.0	35.9	35.5	17.7	17.2	17.6
REDWOOD	S	MS [6]	—	—	36.4	—	—	17.0
D260	S	S	35.0	35.9	35.1	17.6	16.9	17.5
2220	S	MS [5]	—	35.7	35.4	—	17.1	17.3
K-2525+	S	S [6]	—	—	35.7	—	—	16.6
2560	S	S [6]	—	—	35.7	—	—	16.8
CX229	Rps1c	S [6]	—	—	34.7	—	—	17.5
J-251	S	MS	35.3	36.1	35.8	17.4	16.8	17.1
K-2625	S	S [5]	—	36.4	35.5	—	16.4	16.9
J865	S	MS [6]	—	—	35.3	—	—	17.1
IA2008	Rps1	MS	34.3	35.4	34.8	17.5	16.5	16.8
LG6212	S	MS [6]	—	—	36.4	—	—	17.0
2050	S	S	35.8	36.7	35.9	17.1	16.5	17.2
KB246	S	S [6]	—	—	35.8	—	—	17.2
G2100	S	MR [5]	—	37.4	36.7	—	16.4	16.9

Table 10B continued. Disease resistance, protein and oil characteristics of public and private soybean varieties for the southern zone (1994-96; Fairmont, Lamberton, Waseca).

Variety	PR [1]	CR [2]	Protein			Oil		
			1994-96 [3]	1995-96 [3]	1996 [3]	1994-96 [3]	1995-96 [3]	1996 [3]
S-236	S	S [5]	—	36.5	36.1	—	16.4	17.1
590 BRAND	S	MS	36.2	36.9	36.2	17.0	16.5	17.1
2350	S	MS [6]	—	—	35.8	—	—	17.4
3215	S	MR [5]	—	37.2	36.6	—	16.5	17.3
2395	S	S [6]	—	—	35.5	—	—	17.3
3256	S	MS [6]	—	—	35.7	—	—	17.2
EXP 9624	S	MS [6]	—	—	35.1	—	—	17.7
2556	S	MS [6]	—	—	36.2	—	—	17.5
GL2415	S	S	35.0	35.7	35.9	17.6	17.0	17.3
T-3227 [4]	S	S [5]	—	36.0	36.1	—	17.0	17.0
PB-2120	S	S	34.8	35.6	35.3	17.6	17.1	17.2
L 2494	S	MS [5]	—	35.9	35.9	—	17.0	17.5
K-2220	S	S [6]	—	—	34.7	—	—	18.3
9625	S	S [6]	—	—	36.1	—	—	16.9
K-2323+	S	MS	36.5	37.1	36.8	16.9	16.6	17.1
2621	S	MS	36.6	37.4	37.1	16.7	16.2	16.7
PBR-246	S	S [6]	—	—	35.4	—	—	17.5
DG 3210	S	MS [5]	—	37.2	37.0	—	16.2	16.8
DSR-220/STS	S	MS [5]	—	36.4	35.6	—	16.6	16.9
EXP 9622	Rps1k	MR [6]	—	—	35.7	—	—	17.1
DSR-246/STS	S	S [6]	—	—	34.2	—	—	17.7
IA2008R	Rps1k	MS [5]	—	35.4	34.5	—	16.9	17.2
EX2025	S	MS [6]	—	—	35.3	—	—	16.9
2196	S	S [6]	—	—	36.3	—	—	17.0
K-2595	S	MS [6]	—	—	34.5	—	—	17.6
IA2022	S	MS [6]	—	—	34.8	—	—	18.1
K-2111	S	MS [6]	—	—	35.0	—	—	18.4

Table 11A. Comparisons of yields, in bushels per acre, of selected public and private soybean varieties from tests on soybean cyst nematode infested (East Chain, New Richland, and St. James) and non-infested (Fairmont, Lamberton, and Waseca) sites (1994-96).

Note Key:

[1] Relative maturity rating provided by originator. Number before decimal represents maturity group. Number after decimal represents ranking within maturity group.

[2] Date represents the number of days after August 31 that variety reaches maturity.

[3] Blend; information furnished by originator.

Variety	Maturity [1]	Date [2]	Infested Yield			Noninfested Yield		
			1994-96	1995-96	1996	1994-95	1995-96	1996
PARKER	1.5	25	37	37	33	54	54	53
9182	1.8	28	—	—	37	—	—	50
EXP 15951	1.7	29	—	—	38	—	—	50
FREEBORN	1.6	29	38	35	38	49	48	47
FARIBAULT	1.9	29	36	35	37	50	48	45
S18-11	1.8	30	—	—	39	—	—	50
IA2021	2.1	31	—	42	42	—	55	53
STURDY	2.1	31	38	38	35	52	51	51
9234	2.3	31	—	—	40	—	—	45
2220SCN	2.0	32	—	—	43	—	—	53
1882	1.8	32	—	—	40	—	—	51
2444SCN	2.2	32	—	—	43	—	—	50
T-3198CN [3]	2.1	32	41	41	38	55	53	50
EX1983	1.9	33	—	—	38	—	—	49
522CN BRAND	2.1	33	—	39	35	—	47	45
BELL	2.2	33	37	35	32	49	45	42
IA2008R	2.1	35	—	—	36	—	—	51
CX260C	2.6	37	40	37	33	51	49	46
LSD 0.20			1	1	2	1	1	2

Table 11B. Disease resistance, protein and oil characteristics of selected public and private soybean varieties entered in soybean cyst nematode evaluations.

Note Key:

[1] PR=Phytophthora resistance: Rps#=gene present, S=susceptible.

[2] CR=Chlorosis rating, 3-year average unless noted: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible.

[3] SCN=Soybean cyst nematode reaction to a Minnesota isolate that behaves as Race 3: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible.

[4] Protein and oil percentages based on 13% moisture.

[5] 1-year data.

[6] 2-year average.

[7] Blend; information furnished by originator.

Variety	Company Name	PR [1]	CR [2]	SCN [3]	Protein 1996 [4]	Oil 1996 [4]
PARKER 9182	MINN. A.E.S. PIONEER	Rps1 S	S S [5]	S MR	34.3 33.9	17.9 18.2
EXP 15951	ZILLER	Rps1k	S [5]	MR	35.6	17.5
FREEBORN	MINN. A.E.S.	Rps1	MR	MR	36.7	17.2
FARIBAULT	MINN. A.E.S.	Rps1	MR	R	34.1	18.2
S18-11	NK	S	MS [5]	R	37.9	17.1
IA2021	IOWA A.E.S.	Rps1k	S [6]	S	34.4	18.7
STURDY	MINN. A.E.S.	Rps1	MS	S	35.2	17.7
9234	PIONEER	Rps1	MS [5]	R	35.3	17.3
2220SCN	KRUGER	Rps1k	S [5]	S	35.2	17.2
1882	STINE	S	MS [5]	S	34.6	17.4
2444SCN	KRUGER	S	MS [5]	R	34.9	17.7
T-3198CN [7]	THOMPSON	S	MS	S	36.0	17.5
EX 1983	THOMPSON	S	S [5]	S	35.0	17.6
522CN BRAND	LATHAM	S	MS [6]	MR	36.9	17.4
BELL	ILL. A.E.S.	S	MS	MR	36.8	16.9
IA2008R	IOWA A.E.S.	Rps1k	MS [5]	S	34.6	17.3
CX260C	DEKALB	S	S	MR	32.9	18.7

Soybean 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

Use	Bushel Weight (pounds)	Seeds/pound (number)	Rate/acre (pounds)	Rate (seeds)	Planting Date
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	