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# VARIETALS TRIALS OF FARM CROPS

MISCELLANEOUS REPORT 24 - AGRICULTURAL EXPERIMENT STATION - UNIVERSITY OF MINNESOTA

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VARIETAL TRIALS OF FARM CROPS

Successful crop production depends to a considerable extent on selecting the best varieties for a particular farm.

To provide a basis for the selection of varieties, the Minnesota Agricultural Experiment Station compares varieties in trial plots. These trials are conducted on the Agricultural Experiment Stations at St. Paul, Rosemount, Waseca, Lamberton, Morris, Crookston, Grand Rapids, and Becker, and on farmers' fields.

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

On the basis of these comparative trials, the list of varieties recommended for use in Minnesota is revised each year by the Experiment Station Crop Variety Review Committee.

Data for varieties not included in all trials averaged within a table have been adjusted so that averages of varieties tested for different numbers of years can be compared directly.

The LSD (Least Significant Difference) figures listed under the yield columns in the tables are statistical measures of variability within the trials. This statistic is used to determine whether the difference between two yields is due to genetic difference in the varieties or to other causes such as soil variability. If the yield difference between two varieties equals or exceeds the LSD, one can conclude that the higher yielding variety was superior in yield. If the difference is less than the LSD, the yield difference was probably due to environmental rather than varietal differences. The 5 percent significance level used in this report is based on odds of 19 to 1 that yields differing by the amount of the LSD were truly different.

For crops where recommendations are made, varietal descriptions are arranged in order of "recommended varieties," "varieties not adequately tested," and "other varieties," and in alphabetical order within each group.

Recommended varieties have performed better than other varieties in important characteristics in comparative tests. A variety usually is not eligible for recommendation until it has been tested in Minnesota for at least 3 years. New varieties from other public experiment stations and private plant breeders but not sufficiently evaluated here are listed as "not adequately tested." Information now available regarding these varieties is presented but no conclusions are drawn regarding their suitability under Minnesota conditions.

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

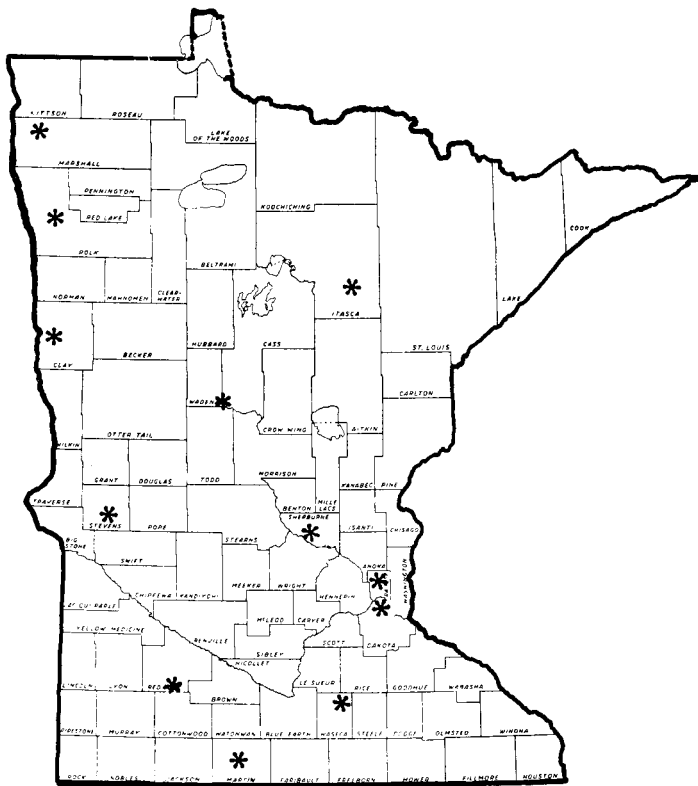
These trials are designed for variety and not crop (species) comparisons, because the various crops were grown on different fields or with different management. The data should only be used to compare varieties within a table.

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

Yields of some forage crops are given in pounds or tons of dry matter per acre. To convert to hay yield at 15 percent moisture (85 percent dry matter), divide the figure given by 0.85. To convert to haylage yield at 55 percent moisture (45 percent dry matter), divide by 0.45.

The use of certified seed of recommended varieties is suggested. Varieties eligible for certification by the Minnesota Crop Improvement Association include varieties recommended by the Minnesota Agricultural Experiment Station, certain new varieties not adequately tested in Minnesota, and certain nonrecommended varieties. Certification does not imply recommendation.

Registered and certified seed of most varieties described in this report can be purchased from seed dealers or from growers listed in the Minnesota Registered and Certified Seed Directory



\* 1976 varietal trials were conducted at these locations.

for 1977 Planting. This annual publication can be obtained without charge from the Minnesota Crop Improvement Association, 1900 Hendon Avenue, St. Paul, Minnesota 55108, or from county extension agents' offices.

Authors of the following sections are: barley, D.C. Rasmusson; oats, D.D. Stuthman; hard red spring, durum, and winter wheat, R.E. Heiner; rye, millet, annual canarygrass, grain sorghum, buckwheat, field peas, field beans, and sunflowers, R.G. Robinson; corn, J.L. Geadelmann and R.H. Peterson; flax, V.E. Comstock; soybeans, J.W. Lambert; alfalfa, birds-foot trefoil, and red clover, D.K. Barnes and F.I. Frosheiser; and bromegrass, orchardgrass, reed canarygrass, and timothy,

A.W. Hovin. Extension agronomists D.R. Hicks and R.L. Thompson also participated in preparing this publication.

Information on the reaction of varieties to specific pathogens was largely obtained by the following members of the Department of Plant Pathology: F.I. Frosheiser, alfalfa; B.W. Kennedy, soybeans; D.V. McVey, wheat; A.P. Roelfs, barley, oats, and wheat; P.G. Rothman, oats; R.D. Wilcoxson, barley, wheat, and oats.

Field work of the varietal trials at Waseca, Lamberton, Morris, Crookston, and Grand Rapids was supervised by W.E. Lueschen, J.H. Ford, D.D. Warnes, L.J. Smith, and D.L. Rabas, respectively.

# BARLEY

## RECOMMENDED VARIETIES

**Beacon** — Medium yield. Early, good resistance to lodging. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a malting variety by Malting Barley Improvement Association (MBIA). Resistant to prevalent leaf spotting diseases, stem rust and loose smut. Developed by North Dakota Agricultural Experiment Station from a cross between Conquest and Dickson. Released in 1973.

**Bonanza** — Medium yield. Later maturing than other recommended varieties. Six-row, semi-smooth awn, long rachilla hairs, blue aleurone. Classified as a malting variety by MBIA. Resistant to loose smut. Developed by Agriculture Canada, Brandon, from a cross involving Vantage, Jet, Vantmore, Parkland, and Conquest. Licensed in 1970.

**Larker** — Medium yield. Six-row, semi-smooth awn, long rachilla hairs, colorless aleurone. Excellent kernel plumpness. Classified as a malting variety by MBIA. Susceptible to loose smut and leaf spotting diseases. Developed by North Dakota Agricultural Experiment Station from a cross of Traill and a selection from UM 570. Released in 1961.

**Manker** — High yield. Medium early, good lodging resistance. Intermediate in kernel plumpness. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a malting variety by MBIA. Good leaf spotting resistance, susceptible to loose smut. Resulted from cross involving Cree, M2, Vantage, Kindred, and Jotun. Released by Minnesota Agricultural Experiment Station in 1974.

**Dickson** — Medium yield and lodging resistance. Kernel plumpness low. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a malting variety by MBIA. Resistant to leaf diseases, susceptible to loose smut. Developed by North Dakota Agricultural Experiment Station from crosses involving Traill, Kindred, and CI 7117-77. Released in 1964.

**Nordic** — Medium-high yield. Medium lodging resistance. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a nonmalting variety by MBIA. Resistant to leaf spotting diseases, including Septoria leaf blotch. Developed by North Dakota Agricultural Experiment Station from crosses of Dickson, CI 4738, Traill, and UM 570. Released in 1971.

## OTHER VARIETIES

**Conquest** — Medium yield, good lodging resistance. Six-row, smooth-awn, long rachilla hairs, blue aleurone. Classified as a malting variety by MBIA. Resistant to loose smut. Developed by Agriculture Canada, Brandon, from crosses involving Vantage, Jet, Vantmore, Br. 4634-4456, UM 570, and Parkland. Released in 1965.

**Cree** — High yield, medium in maturity and lodging. Kernel plumpness low. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a nonmalting variety by MBIA. Resistant to loose smut, moderately resistant to leaf spotting diseases. Developed at Minnesota Agricultural Experiment Station from crosses involving Traill, Br. 5750-2 and Dickson. Released in 1972.



Manker barley performed well in this 1976 trial according to agronomist D.C. Rasmusson.

Table 1. Yield of barley varieties in bushels per acre, 1971-1976

Variety	Morris 8 <sup>1</sup>	Crookston 9	Stephen 4	St. Paul 4	Lamberton 3	Average (28 trials)
Beacon	56	70	59	61	74	64
Larker	54	72	58	64	77	64
Manker	60	72	57	70	75	69
Cree	55	76	69	66	78	68
Bonanza	56	73	63	64	70	65
LSD 5%	5	4	3	6	7	2

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

Table 2. Characteristics of barley varieties

Variety	Heading (June)	Height (inches)	Lodging (percent)	Protein (percent)	Plump kernels (percent)	Reactions to Disease <sup>1</sup>		
						Stem rust	Loose smut	Spot blotch
Beacon	20	33	26	13.5	55	R	R	R
Larker	22	32	40	13.2	71	R	S	S
Manker	21	32	27	13.0	58	R	S	R
Cree	22	31	38	—	45	R	R	MR
Bonanza	24	35	30	12.5	57	R	R	S

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

## OATS

The losses from oat smut in susceptible varieties increased greatly in 1976. Since the disease is primarily seed carried, seed of susceptible varieties should be treated with a chemical to control oat smut.

### RECOMMENDED VARIETIES

**Chief** — Early-medium maturity, high yield, medium height, good lodging resistance, high test weight and groat percentage, medium protein content, yellow seed. Susceptible to crown rust and smut. Selected at South Dakota Agricultural Experiment Station from a cross between Clintland 64 and Garland. Released in 1972.

**Dal** — Late, medium yield and height, fair lodging resistance, high test weight, medium groat percentage, high protein content, ivory seed. Resistant to crown rust and smut. Selected at Wisconsin Agricultural Experiment Station from a cross involving Trispernia, Belar and Beedee. Released in 1972. Seed sale regulated by U.S. Variety Protection Act.

**Froker** — Late, high yield, medium height, good lodging resistance, high test weight and groat percentage, medium protein content, yellow seed. Susceptible to crown rust and smut. Selected at Wisconsin Agricultural Experiment Station from a cross involving sister lines of Beedee and Garland, and a foreign introduction. Released in 1970.

**Lodi** — Late, high yield, tall, fair lodging resistance, medium test weight, groat percentage and protein content, white seed. Susceptible to crown rust, some resistance to smut. Selected at Wisconsin Agricultural Experiment Station from a cross involving several lines. Released in 1963.

**Noble** — Early-medium maturity, high yield, medium height, good lodging resistance, medium test weight, low groat percentage, medium protein content, yellow seed. Susceptible to crown rust, resistant to smut. Selected at Purdue Agricultural Experiment Station from a cross involving many lines. Released in 1973. Seed sale regulated by U.S. Variety Protection Act.

**Stout** — Early-medium maturity, high yield, short, good lodging resistance, medium test weight, high groat percentage, medium protein content, white seed. Some resistance to crown rust, susceptible to smut. Selected at Purdue Agricultural Experiment Station from a cross involving many lines. Released in 1973. Seed sale regulated by U.S. Variety Protection Act.



Pathologist M.B. Moore and agronomist D.D. Stuthman discuss drought and diseases over a plot of Lodi oats.

### VARIETIES NOT ADEQUATELY TESTED

**Hudson** — Late, high yield, medium height, poor lodging resistance, low test weight, medium groat percentage, low protein content, white seed. Resistant to crown rust, susceptible to smut. Selected by Agriculture Canada, Winnipeg, from a cross involving several lines. Licensed in 1974.

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

**Spears** — Early-medium maturity, high yield, medium height, good lodging resistance; medium test weight, groat percentage, and protein content; white seed. Susceptible to crown rust and smut. Selected at South Dakota Agricultural Experiment Station from a cross between Neal and Clintland 64. Released in 1974.

## OTHER VARIETIES

**Diana** — Early-medium maturity, high yield, medium height, good lodging resistance, high test weight and groat percentage, medium protein content, yellow seed. Susceptible to crown rust and smut. Selected at Purdue Agricultural Experiment Station from a cross involving many lines. Released in 1970.

**Garland** — Early-medium maturity, medium yield, short, poor lodging resistance, high test weight and groat percentage, yellow seed. Susceptible to crown rust, resistant to smut. Selected at Wisconsin Agricultural Experiment Station from a cross involving several lines. Released in 1962.

**Goodland** — Late, low yield, medium height, good lodging resistance, medium test weight and groat percentage, high protein content, yellow seed. Resistant to crown rust and smut. Selected at Wisconsin Agricultural Experiment Station from a cross of several lines, including Garland. Released in 1974. Seed sale regulated by U.S. Variety Protection Act.

**Iowa Early Multiline Blend (E73, E74, and E76)** — Early, low yield, medium height, good lodging resistance, high test weight and groat percentage, medium protein content, yellow seed. Heterogeneous crown rust reaction, susceptible to smut. The recurrent parent is C.I. 7970. Developed at Iowa Agricultural Experiment Station and originally released in 1968.

**Iowa Midseason Multiline Blend (M73)** — Early-medium maturity, medium yield and height, fair lodging resistance, high test weight and groat percentage, medium protein content, yellow seed. Heterogeneous reaction to crown rust, susceptible to smut. The recurrent parent is C.I. 7555, a Clintland type. Developed at Iowa Agricultural Experiment Station and originally released in 1968.

**Korwood** — Late, high yield, medium height, poor lodging resistance, medium test weight, high groat percentage, medium protein content, white seed. Susceptible to crown rust and smut. Selected at Michigan Agricultural Experiment Station from a cross involving several lines. Released in 1974.

**Otee** — Early-medium maturity, high yield, medium height, good lodging resistance, high test weight, medium groat percentage, high protein content, white seed. Susceptible to crown rust and smut, tolerant to red leaf. Selected at Illinois Agricultural Experiment Station from a cross involving several lines. Released in 1973.

**Otter** — Medium maturity, high yield, short, good lodging resistance, medium test weight and high groat percentage, white seed. Some resistance to crown rust and smut. Selected at Minnesota Agricultural Experiment Station from crosses involving several lines. Released in 1970.

**Portal** — Medium-late maturity, high yield, medium height fair lodging resistance, high test weight and groat percentage, yellow seed. Some resistance to crown rust. Selected at Wisconsin Agricultural Experiment Station from the cross PI 174544 x Garland. Released in 1966.

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

**Wright** — Late, medium yield and height, poor lodging resistance, high test weight, medium groat percentage and protein content, tan seed. Resistant to crown rust. Selected at Wisconsin Agricultural Experiment Station from a Beedee back-cross. Released in 1975. Seed sale regulated by U.S. Variety Protection Act.

Table 3. Yield of oat varieties in bushels per acre, 1974-76

Variety	Rosemount	Waseca	Lamberton <sup>1</sup>	Morris <sup>1</sup>	Crookston	Grand Rapids	Average
M-73	92	94	97	102	83	73	90
Otee	96	103	115	90	87	70	93
Chief	98	110	100	95	92	74	95
Noble	96	109	118	111	104	81	103
Spear	99	104	118	102	94	71	98
Stout	97	108	116	98	99	73	98
Goodland	91	86	85	77	79	62	80
Froker	100	105	99	96	95	73	94
Wright	92	100	104	89	97	69	92
Hudson <sup>2</sup>	101	115	83	81	116	85	97
Korwood	101	113	106	96	100	77	99
Lodi	98	106	97	94	105	80	97
Dal	91	92	99	94	88	72	89
LSD 5%	7	9	10	10	4	7	3

<sup>1</sup> 1974-75. <sup>2</sup> 1974 at Crookston and Grand Rapids.

Table 4. Characteristics of oat varieties, 1974-76

Variety	Heading (date)	Height (inches)	Lodging <sup>1</sup> (score)	Test weight/bushel (pounds)	Groat (percent)	Protein percent		Protein/acre (pounds)	Reactions to disease <sup>2</sup>	
						groat	seed		Crown rust	Smut
M-73	23	35	1.9	40	75	18.8	14.1	403	I	S
Otee	23	33	1.2	39	73	20.8	15.2	447	S	S
Chief	24	35	1.7	39	75	18.7	14.1	428	S	S
Noble	24	33	1.4	40	72	18.6	13.3	427	S	R
Spear	24	34	1.6	39	74	19.7	14.5	444	S	S
Stout	24	30	1.2	39	74	17.9	13.2	410	MR	S
Goodland	27	33	1.6	39	74	21.0	15.5	406	R	R
Froker	27	37	1.6	40	75	18.0	13.5	409	S	S
Wright	27	38	2.8	41	75	19.4	14.4	424	R	—
Hudson	28	36	3.6	36	74	16.2	11.9	390	R	S
Korwood	28	36	2.4	40	75	17.7	13.3	422	S	S
Lodi	28	40	2.0	39	73	18.4	13.5	420	S	I
Dal	29	36	1.9	40	74	20.1	14.9	428	R	R

<sup>1</sup> 1973-75. 1 = erect, 5 = flat. <sup>2</sup> 1976. R = resistant, MR = moderately resistant, I = mixed or intermediate, S = susceptible.

## WINTER RYE

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

### RECOMMENDED VARIETIES

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

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

### OTHER VARIETIES

**Cougar** — Medium yield, winterhardy (only fair hardiness in eastern Minnesota trials), late, medium height. Fair lodging resistance. Small seed of green and tan color, and medium test weight. Originated by University of Manitoba from an open-pollinated selection in a composite cross of European and

Canadian varieties. Licensed in 1967.

**Frontier** — Medium yield, very winterhardy, medium maturity, tall. Poor lodging resistance. Small seed of predominantly blue-gray color and high test weight. Developed by Agriculture Canada, Swift Current, from a cross of Dakold 23 and Petkus. Licensed in 1965. *If winterhardiness is of primary concern, grow Frontier instead of the recommended varieties.*

**Kodiak** — Medium yield, winterhardy, medium maturity, tall. Poor lodging resistance. Medium size seed of light tan color and low test weight. Selected from Sangaste by University of Alberta. Licensed in 1971.

**Kustro** — Medium yield, poor winterhardiness, late, short. Excellent lodging resistance. Large seed of predominantly greenish-gray color and high test weight. Developed in Germany and named about 1970. Licensed in Canada in 1971.

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

Table 5. Yields of winter rye varieties in bushels per acre

Variety	Rosemount 1973-76	Morris 1973-76	Grand Rapids 1973-76	Crookston 1975-76	Average (14 trials)
Puma	47	44	46	29	43
Rymin	57	42	47	29	46
Cougar	46	44	42	26	42
Von Lochow	56	41	45	21	44
LSD 5%	3	4	3	6	2
Kustro <sup>1</sup>	56	42	35	21	41

<sup>1</sup> 1974-76.

Table 6. Characteristics of winter rye varieties, 14 trials, 4 locations, 1973-76

Variety	Winterkill (percent)	Heading (June)	Mature (July)	Lodging <sup>1</sup> (score)	Height (inches)	Weight/100 seeds (grams)	Test weight/bushel (pounds)
Puma	3	1	23	3.6	52	2.3	55.7
Rymin	5	1	23	2.6	50	2.7	56.2
Cougar	4	3	24	3.1	49	2.3	55.1
Von Lochow	11	1	23	2.7	50	2.8	56.1
Kustro	18	5	24	2.3	47	2.7	56.2

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



Rymin and Von Lochow rye varieties on sandy soil grew waist-high to agronomist D.L. Rabas in 1976.

## HARD RED SPRING WHEAT



**Agronomist H.W. Johnson, head of Agronomy and Plant Genetics, examines a spike of Kitt, a high-protein, semi-dwarf wheat variety.**

### RECOMMENDED VARIETIES

**Era** — Awned, midseason to late semidwarf with high lodging resistance. Resistant to stem and leaf rust. Tolerant of Septoria, bunt, and ergot. Very high yield and high test weight. Milling characteristics are satisfactory. Protein content and bake absorption are low. Selected from crosses involving Frontana, Thatcher, Mida, Kenya 117A, Kenya 58, Lee, Newthatch, Pembina, and Polk "sib." Released by Minnesota Agricultural Experiment Station in 1970.

**Kitt** — Awned, midseason to late semidwarf with high lodging resistance. Resistant to stem rust and has broader spectrum of resistance to leaf rust than Chris and Era. Tolerant of black chaff, bacterial leaf blight, and ergot, but susceptible to loose smut. Very high yield and medium to low test weight. Milling and baking characteristics are satisfactory. Protein content and bake absorption are lower than Chris, but better than Era. Selected from crosses involving Frontana, Thatcher, Mida, Kenya 117A, Kenya 58, Lee, Newthatch, Pembina, and Polk "sib." Released by Minnesota Agricultural Experiment Station and ARS-USDA in 1975.

**Olaf** — Awned, semidwarf, medium maturity with high lodging resistance. Resistant to stem and leaf rust. High yield and medium test weight. Protein content and bake absorption are lower than Chris, but better than Era. Tendency to have long dough mixing requirements. Selected from crosses involving Conley, Justin and Waldron. Released by North Dakota Agricultural Experiment Station in 1973.

### VARIETIES NOT ADEQUATELY TESTED

**Bounty 309** — Awned, medium to early maturing semidwarf with high lodging resistance. Moderately susceptible to leaf rust. Moderately resistant to stem rust if planted early; moderately susceptible to stem rust if planted late. Preliminary data show high yield and medium test weight. Insufficient data on milling and baking characteristics. Developed by Cargill, Inc., and approved for certification in 1972. Seed sale regulated by U.S. Variety Protection Act.

**Wared** — Awned, midseason to late semidwarf with high lodging resistance. Resistant to stem and leaf rust. Tolerant of Septoria, bunt, and ergot. High yield and high test weight. Milling and baking characteristics are slightly higher than Era but are lower than Kitt, Olaf, and World Seeds 1809. Selected from crosses involving Frontana, Thatcher, Mida, Kenya 117A, Kenya 58, Lee, Newthatch, Pembina, and Polk "sib" at the Minnesota Agricultural Experiment Station. Released by the Washington Agricultural Experiment Station and ARS-USDA in 1974.

### OTHER VARIETIES

**Chris** — Awnless, medium height and maturity. Fair resistance to lodging. Resistant to stem rust but ranges from resistant to moderately susceptible to leaf rust. Medium yield and test weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Frontana, Kenya 58, Newthatch, and Thatcher. Released by Minnesota Agricultural Experiment Station and ARS-USDA in 1965.

**Ellar** — Awnless, early, medium height and lodging resistance. Resistant to stem rust and moderately resistant to leaf rust. Medium yield and test weight. Flour yield and wheat protein are lower than Chris, but better than Era. Milling and baking characteristics are satisfactory. Selected from crosses involving Waldron, Kenya Farmer, Lee, Mida, and Cadet. Released by North Dakota Agricultural Experiment Station in 1974.

**Fletcher** — Awned, midseason to late semidwarf with high lodging resistance. Resistant to stem rust but moderately susceptible to leaf rust. Tolerant of Septoria, bunt, and ergot. High yield and medium test weight. Milling characteristics are satisfactory. Protein content and bake absorption are lower than Chris, but better than Era. Selected from crosses involving Frontana, Thatcher, Mida, Kenya 117A, Kenya 58, Lee, Newthatch, Pembina, and Polk "sib." Released by Minnesota Agricultural Experiment Station and ARS-USDA in 1970.

**Glenlea** — Awnless, medium height and maturity with high lodging resistance. Resistant to stem rust, but moderately susceptible to leaf rust. Medium to high yield and medium test weight with very large kernels. Milling and baking characteristics are unsatisfactory. Developed by University of Manitoba. Licensed in 1972.

Table 7. Characteristics of hard red spring wheat varieties, 1974-76

Variety	Heading (June)	Plant height (inches)	Lodging (score) <sup>1</sup>	Rust Reaction <sup>2</sup>		1000 kernel wt. (grams) <sup>4</sup>	Test weight/bushel (pounds)	Wheat protein (percent) <sup>4</sup>	Milling, baking quality	Yield, bushels/acre					
				Leaf	Stem					Waseca	St. Paul	Morris	Crookston	Stephen <sup>5</sup>	Av. <sup>5</sup>
Era	26	30	2.0	R-MR	R	30	61.9	12.7	low-med.	72	39	39	49	78	49
Kitt	25	30	2.0	R	R	33	59.2	14.4	med.-high	72	37	38	44	75	46
Olaf	25	32	1.9	R	R	34	61.3	14.1	medium	71	38	36	40	66	43
Chris	25	39	3.5	R-MS	R	28	61.4	15.2	V. high	59	30	34	37	56	38
Ellar	23	37	2.2	MR-MS	R	34	61.2	14.7	medium	56	31	38	38	63	41
Fletcher <sup>3</sup>	27	30	1.9	MS	R	32	60.5	13.8	medium		34	31	42	68	42
Glenlea	25	39	2.1	MS	MR	39	60.3	14.1	low	48	33	36	36	68	41
Nowesta <sup>3</sup>	23	37	3.0	MS-S	MR	29	60.1	14.5	low-med.		32	35	43	—	—
Polk	24	38	3.4	R-MS	R	36	62.6	14.7	V. high		32	32	39	61	39
Prodax	23	30	2.0	S	R	34	59.3	13.6	med.-low	72	34	35	43	76	44
Profit 75	22	29	2.0	R-MR	R	27	60.4	13.4	low	74	36	37	39	70	44
Protor	22	29	1.9	MS	R	31	61.8	14.0	low	64	40	37	37	72	44
Waldron	23	37	2.1	R	R	33	60.6	14.8	high	66	37	37	39	65	43
Wared <sup>3</sup>	27	33	2.0	R	R	30	62.3	13.5	low-med.		32	31	38	77	44
W.S. 25	22	31	2.0	R	R	27	60.0	13.4	low		36	37	41	71	44
World Seeds 1809	19	28	1.5	R-MR	R	29	60.8	14.2	medium	67	38	35	35	63	41
LSD 5%										11	5	4	3	10	3

<sup>1</sup> 1 = erect, 9 = flat. <sup>2</sup> Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. <sup>3</sup> 1975-76 data. <sup>4</sup> 1974-75 data. <sup>5</sup> Waseca data not included in average.

**Lark** — Awned, early semidwarf with high lodging resistance. Resistant to stem and leaf rust. Moderately susceptible to black chaff. High yield and medium test weight. Quality data show lower protein and bake adsorption than Chris. Released by World Seeds Inc. in 1971.

**Nordak** — Awned, medium height and maturity. Fair resistance to lodging. Resistant to stem rust and resistant to moderately susceptible to leaf rust; susceptible to loose smut. Medium yield and test weight. Satisfactory milling and baking quality. Selected as a single plant in a field of durum wheat by A.H. Berg, Barney, North Dakota. Released to farmers in 1971.

**Nowesta** — Awned, medium height, maturity, and lodging resistance. Moderately susceptible to leaf rust and moderately resistant to stem rust. Medium to high yield and medium test weight. Milling and baking characteristics are poor to medium. Selected as an individual plant from the variety Waldron. Originated in Drayton, North Dakota.

**Polk** — Awned, bronze chaff, medium height and maturity. Medium resistance to lodging. Resistant to stem rust but ranges from resistant to moderately susceptible to leaf rust. Medium yield and very high test weight. Satisfactory milling and baking characteristics. Selected from crosses involving Thatcher, Supreza, Frontana, Kenya 58, and Newthatch. Released by Minnesota Agricultural Experiment Station and ARS-USDA in 1968.

**Prodax** — Awned, semidwarf, medium maturity with high lodging resistance. Susceptible to leaf rust, but resistant to stem rust. High yield and medium to low test weight. Medium to poor milling and baking characteristics. Developed by Northrup, King & Co. and approved for certification in 1974. Seed sale regulated by U.S. Variety Protection Act.

**Profit 75** — Awned, early semidwarf with high lodging resistance. Resistant to stem and leaf rust. High yield and medium test weight. Unsatisfactory milling and baking characteristics. Released by World Seeds Inc., Oceanside, California, in 1974. Seed sale regulated by U.S. Variety Protection Act.

**Protor** — Awned, early semidwarf with high lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust; susceptible to ergot. High yield and medium test weight. Unsatisfactory milling and baking quality. Selected from the cross of Tobari by Ciano. Released by Northrup, King & Co. in 1972.

**Waldron** — Awnless, yellow chaff, early, and medium height. Very lodging resistant. Resistant to stem and leaf rust. Very susceptible to ergot. Susceptible to Septoria. High yield and medium test weight. Satisfactory milling and baking characteristics. Selected from crosses involving Lee, Mida, K338AA, and Justin. Released by North Dakota Agricultural Experiment Station in 1969.

**W.S. 6** — Awned, early semidwarf with high lodging resistance. Resistant to stem and leaf rust. Medium yield and test weight. Unsatisfactory milling and baking characteristics. Released by World Seeds Inc. in 1973. Seed sale regulated by U.S. Variety Protection Act.

**W.S. 25** — Awned, early semidwarf with high lodging resistance. Resistant to stem and leaf rust. High yield and medium test weight. Dough handling and mixing characteristics are poor. Grain protein content and bake adsorption are much lower than Olaf, Kitt, and World Seeds 1809. Unsatisfactory quality. Developed by World Seeds Inc. Oceanside, CA and approved for certification in 1976. Seed sale regulated by U.S. Variety Protection Act.

**World Seeds 1809** — Awnless, very early semidwarf with high lodging resistance. Resistant to stem and leaf rust but susceptible to loose smut. High yield and medium test weight. Milling and baking characteristics are satisfactory. Protein content and bake adsorption are lower than Chris, but better than Era. Released by World Seeds Inc. in 1970. Seed sale regulated by U.S. Variety Protection Act.



# DURUM WHEAT

## RECOMMENDED VARIETIES

**Crosby** — Awned, early, medium height and lodging resistance. Resistant to leaf and stem rust. High yield and medium test weight with large kernels. Satisfactory quality for semolina products. Selected from crosses involving Langdon, ST 464, and Leeds. Released by North Dakota Agricultural Experiment Station in 1973.

**Rugby** — Awned, early, medium height with high lodging resistance. Resistant to stem and leaf rust. High yield and medium test weight with large kernels. Satisfactory quality for semolina products. Selected from crosses involving Heiti, Stewart, Carleton, Mindum, and Nugget. Released by North Dakota Agricultural Experiment Station in 1973.

**Ward** — Awned, early, medium height and lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield, test, and 1,000 kernel weight. Satisfactory quality for semolina products. Selected from crosses involving Langdon, Leeds, and Wells. Released by North Dakota Agricultural Experiment Station in 1972.

## VARIETIES NOT ADEQUATELY TESTED

**Cando** — Awned, medium maturing semidwarf with high lodging resistance. Resistant to stem rust and moderately resistant to leaf rust. High yield and medium test weight. Satisfactory quality for semolina products. Selected from crosses involving Lakota, Willet 'sib' Norin 10/Brevor, Langdon, Leeds, and Wells. Released by the North Dakota Agricultural Experiment Station in 1975.

## OTHER VARIETIES

**Botno** — Awned, early, medium height, and high lodging resistance. Resistant to stem rust, but moderately susceptible to leaf rust. High yield and medium test weight with large kernels. Satisfactory quality for semolina products. Selected from crosses involving Heiti, Stewart, Carleton, Mindum, and Nugget. Released by North Dakota Agricultural Experiment Station in 1973.

**Hercules** — Awned, early, medium height, and high lodging resistance. Resistant to stem rust, susceptible to leaf rust and Septoria. Medium yield and test weight. Satisfactory quality for semolina products. Released by Agriculture Canada, Winnipeg in 1969.

**Lakota** — Awned, early, medium height and lodging resistance. Resistant to stem rust, bunt, and loose smut. Moderately susceptible to leaf rust. High yield and fair test weight. Satisfac-

tory quality for semolina products. Selected from crosses involving Sentry, Ld. 379, and Ld. 357. Released by North Dakota Agricultural Experiment Station in 1960.

**Leeds** — Awned, early, medium height and lodging resistance. Moderately resistant to leaf rust, resistant to stem rust and loose smut. Medium yield and very high test weight with large kernels. Satisfactory quality for semolina products. Selected from crosses involving Br. 180 and Wells. Released by North Dakota Agricultural Experiment Station in 1966.

**Macoun** — Awned, medium maturity and height with high lodging resistance. Resistant to stem rust; moderately susceptible to leaf rust. Medium yield and test weight with large kernels. Satisfactory quality for semolina products. Selected from crosses involving RL3607/DT182. Licensed by Agriculture Canada, Swift Current, in 1973.

**Mindum** — Awned and amber-kerneled. Resistant to bunt, leaf rust, and loose smut; susceptible to scab and stem rust. Susceptible to lodging. Medium yield and high test weight. Excellent for semolina products. Resulted from a durum type selected from a common bread wheat field at Minnesota Agricultural Experiment Station in 1917.

**Rolette** — Awned, early, medium height, and high lodging resistance. Resistant to stem rust, moderately susceptible to leaf rust. High yield and high test weight. Satisfactory quality for semolina products. Selected from crosses involving Ld. 393, Langdon, Ld. 398, Ld. 357, and St. 464. Released by North Dakota Agricultural Experiment Station in 1971.

**Wakooma** — Awned, early, medium height and high lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. Medium yield and low test weight. Satisfactory quality for semolina products. Selected from crosses involving Lakota and Pelissier. Licensed by Agriculture Canada, Swift Current, in 1973.

**Wascana** — Awned, early, medium height and lodging resistance. Resistant to stem rust and moderately resistant to leaf rust. Medium yield and low test weight. Satisfactory quality for semolina products. Selected from crosses involving Lakota and Pelissier. Licensed by Agriculture Canada, Swift Current, in 1971.

**Wells** — Awned, early, medium height and lodging resistance. Moderately resistant to leaf rust; resistant to stem rust, bunt, and loose smut. High yield, medium test weight and small kernel size. Satisfactory quality for semolina products. Selected from crosses involving Sentry, Ld. 379, and Ld. 357. Released by North Dakota Agricultural Experiment Station in 1960.

Table 8. Characteristics of durum wheat varieties, 1974-76

Variety	Heading (June)	Plant height (inches)	Lodging (score) <sup>1</sup>	Rust reaction <sup>2</sup>		1000 kernel wt. (grams) <sup>4</sup>	Test weight/bushel (pounds)	Yield, bushels/acre				
				Leaf	Stem			Waseca	Morris	Crookston	Stephen <sup>3</sup>	Av. <sup>5</sup>
Crosby	26	37	1.8	R	R	38	61.4	—	37	43	68	38
Rugby	27	37	1.6	R	R	36	61.8	—	39	41	70	39
Ward	26	36	1.6	MS	R	38	61.5	66	36	40	71	37
Botno	25	36	1.5	MR	R	38	62.8	—	35	38	69	36
Cando	27	28	1.8	MS	R	34	61.0	69	32	44	—	35
Lakota	27	38	2.0	MS	R	—	60.3	—	38	41	—	39
Leeds	27	37	2.4	MR	R	37	63.7	—	33	37	—	34
Macoun	28	36	2.1	MS	R	38	60.4	—	29	36	—	31
Mindum	29	44	4.0	R	S	36	61.5	—	25	27	—	26
Rolette	25	34	2.3	MS	R	40	62.8	—	34	45	67	37
Wakooma	29	38	2.5	MS	R	36	61.0	—	32	36	—	33
Wells	27	37	2.7	MR	R	32	62.2	—	35	39	—	36
LSD 5%									3	4		2

<sup>1</sup> 1 = erect, 9 = flat. <sup>2</sup> Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible.

<sup>3</sup> 1975-76 data. <sup>4</sup> 1974-75 data. <sup>5</sup> Stephen and Waseca data not included in average.

# WINTER WHEAT

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

## RECOMMENDED VARIETIES

**Gent** — Awned, early, medium height and lodging resistance. Winterhardiness lower than Minter but better than Centurk. Moderately resistant to leaf and stem rust. High yield and test weight. Satisfactory quality. Made by compositing nine selections from crosses of Agent and Scout. Developed at Hays, Kansas, but tested and released by South Dakota Agricultural Experiment Station in 1974.

**Minter** — Awned, tall, winterhardy, and medium lodging resistance. Moderately susceptible to leaf and stem rust. Medium yield and test weight. Satisfactory quality characteristics. Selected from a backcross of Hope and Minturki. Released by the Minnesota Agricultural Experiment Station and ARS-USDA in 1949.

**Winoka** — Awned, winterhardy, medium height, maturity,



Gent winter wheat growing among the pines of northern Minnesota, is examined by agronomist R.L. Thompson.

and lodging resistance. Susceptible to leaf rust and moderately resistant to stem rust. Severe leaf necrosis in certain years. Satisfactory milling and baking characteristics. Reselection from Winalta by South Dakota Agricultural Experiment Station in 1968.

## VARIETIES NOT ADEQUATELY TESTED

**Eklund** — Awnless, very tall, medium to late maturity with medium lodging resistance. Insufficient data on agronomic and quality characteristics. Selected as an individual plant from the variety Minter by Mr. Eklund in northern Minnesota. Seed was available for commercial sowing in 1976. Seed sale regulated by U.S. Variety Protection Act.

**Roughrider** — Awned, medium height, maturity, and lodging resistance. The variety has not been tested in Minnesota. Released by the North Dakota Agricultural Experiment Station in 1975.

## OTHER VARIETIES

**Bronze** — Awned, early, medium height and lodging resistance. Moderately winterhardy. Susceptible to leaf rust, but resistant to stem rust. High yield and medium test weight. Milling and baking characteristics satisfactory. Selected from Cycle II, Series I of a recurrent selection scheme. Released by South Dakota Agricultural Experiment Station in 1972.

**Centurk** — Awned, early, medium height and lodging resistance. Winterhardiness is not satisfactory. Susceptible to leaf rust and moderately resistant to stem rust. Satisfactory quality. Selected from crosses involving Kenya 58, Newthatch, Hope, Turkey, Cheyenne, and Parker. Released by Nebraska Agricultural Experiment Station in 1971. Seed sale regulated by U.S. Variety Protection Act.

**Froid** — Awned, winterhardy, medium height, maturity, and lodging resistance. Moderately resistant to stem rust, susceptible to leaf rust. High yield, but lower than average test weight. Satisfactory milling and baking characteristics. Selected from a population of unknown origin at Montana Agricultural Experiment Station in 1968.

**Sundance** — Awned, tall, winterhardy, medium lodging resistance. Susceptible to leaf and stem rust. Low yield and medium test weight. Satisfactory quality characteristics. Selected from a cross involving Cheyenne and Kharkof. Licensed by Agriculture Canada, Winnipeg, in 1971.

**Warrior** — Awned, early, medium height and lodging resistance. Winterhardiness is not satisfactory. Susceptible to leaf and stem rust. Medium yield and test weight. Satisfactory quality. Selected from a cross of Pawnee and Cheyenne at Nebraska Agricultural Experiment Station.

Table 9. Characteristics of winter wheat varieties, 1974-76

Variety	Heading (June)	Plant height (inches)	Winter survival (percent)	Lodging <sup>1</sup> (score)	Rust reaction <sup>2</sup>		Test weight per bushel (pounds)	Yield, bushels/acre		
					Leaf	Stem		St. Paul		4-Location <sup>3</sup> average
								1976	1974-76	
Gent	1	39	68	2.5	MR	R	61.5	33	43	42
Minter	5	44	87	4.0	MS	MS	61.2	30	30	38
Winoka	3	41	83	4.0	S	MR	61.3	38	35	38
Bronze	1	38	71	3.3	S	R	59.5	32	34	35
Centurk	1	38	63	2.5	S	MR	59.6	40	44	41
Froid	3	43	84	4.0	S	MR-S	60.0	31	30	37
Sundance	6	42	89	3.3	S	S	57.0	38	33	40
Warrior	3	40	58	3.3	S	S	60.0	—	32	—
Sentinel	2	38	92	3.3	S	MR	60.0	43	—	—
Lancota	2	38	77	3.0	S	MS-S	61.0	35	—	—
Eklund	5	45	97	4.0	—	—	60.0	35	—	—
LSD 5%								5	4	3

<sup>1</sup> 1 = erect, 9 = flat. <sup>2</sup> Reaction to prevalent races: R = resistant, S = susceptible, MR = moderately resistant.

<sup>3</sup> 1975 and 1976 data from Waseca, Lamberton, Staples and Fosston.

# MILLET

Three types of millet are adapted in Minnesota: proso, foxtail, and barnyard (Japanese). Proso varieties are grown for grain for bird or livestock feed. Foxtail varieties and Japanese are grown for silage or hay.

lodging resistance. Medium size, orange seed of high test weight. Introduced from Russia by U.S. Department of Agriculture in 1903.

## RECOMMENDED VARIETIES

**Cerise** — Red proso. Very early. Medium height. Fair lodging resistance. Medium size, orange seed of high test weight. Composite selection from P.I. 170603 by Nebraska Agricultural Experiment Station. Released in 1974.

**Dawn** — White proso. Very early. Short. Fair lodging resistance. Medium size, white seed of medium test weight. Bulk selection from IPm 1108 (P.I. 260053) by Nebraska Agricultural Experiment Station. Released in 1976.

**Empire** — Foxtail. Late. Tall. Poor lodging resistance. Very small, plump yellow seed of medium test weight. Originated by Agriculture Canada.

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

**Snobird** — White proso. Early. Medium height. Poor lodging resistance. Large, white seed of medium test weight. Selected from white proso by Minnesota Agricultural Experiment Station. Released in 1973.

**Turghai** — Red proso. Very early. Medium height. Good

## OTHER VARIETIES

**Abarr** — White proso. Late. Medium height. Poor lodging resistance. Large, white seed of medium test weight. Selected from white proso by Colorado Agricultural Experiment Station. Released in 1976.

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

**Butte** — Foxtail. Late. Medium height. Good lodging resistance. Small, yellow seed of low test weight. Bulk selection from Harkovakaja Russian variety by Colorado Agricultural Experiment Station. Released in 1975.

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

**Manta** — Foxtail. Early. Short. Poor lodging resistance. Small, orange seed. Low forage yield. Selection from Manchurian by South Dakota Agricultural Experiment Station. Released in 1958.

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

Table 10. Yields of proso millet varieties in pounds per acre

Variety	Rosemount 1974-76	Elk River-Becker 1974-76	Grand Rapids 1976	Lamberton 1976	Average (14 trials)
Dawn	3330	1595	2163	2392	2436
Minco	3492	1509	1546	1128	2334
Snobird	3012	1298	1249	1766	2063
Abarr	3039	1269	1309	1105	2019
Cerise	2914	1610	1482	1575	2157
Turghai	2865	1530	1342	1727	2103
LSD 5%	316	199	351	475	175

Table 11. Characteristics of proso millet varieties, 1974-76

Variety	Planting to heading (days)	Planting to maturity (days)	Lodging <sup>1</sup> (score)	Height (inches)	Weight/100 seeds (grams)	Test weight/bushel (pounds)
Dawn	50	79	2.2	28	.66	53.1
Minco	54	91	2.2	36	.65	53.9
Snobird	52	87	2.6	36	.68	53.5
Abarr	56	89	3.0	38	.71	51.8
Cerise	50	79	2.2	36	.60	57.5
Turghai	50	81	1.6	36	.57	57.3

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

Table 12. Characteristics of foxtail millet varieties at Rosemount, 1974-76

Variety	Forage <sup>1</sup>		Seed			Planting to heading (days)	Lodging (score) <sup>2</sup>	Height (inches)
	Yield/acre (pounds)	Protein (percent)	Yield/acre (pounds)	Test weight/bushel (pounds)	Weight/100 (grams)			
Empire	9261	7.4	1603	50.5	.19	64	2.9	42
Butte	8264	7.8	1023	43.3	.30	67	1.5	38
White Wonder	8689	7.2	1127	46.5	.24	69	2.0	43
LSD 5%	658		289					

<sup>1</sup> Oven-dry moisture basis.

<sup>2</sup> 1 = erect, 9 = flat.

# ANNUAL CANARYGRASS



Agronomist R.G. Robinson discusses canarygrass varieties at a July field day in northern Minnesota.

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

Few named varieties exist but about 100 seed collections from commercial lots, other states, and other countries have been tested. In these tests, Alden yielded more than the best available seedlots and varieties.

## RECOMMENDED VARIETIES

**Alden** — High yield, late and tall. Fair to poor lodging re-

sistance. Large heads with good shattering resistance. Developed cooperatively by Minnesota Agricultural Experiment Station and Minn-Dak Growers Association from P.I. 251390 from Iran. Released in 1973.

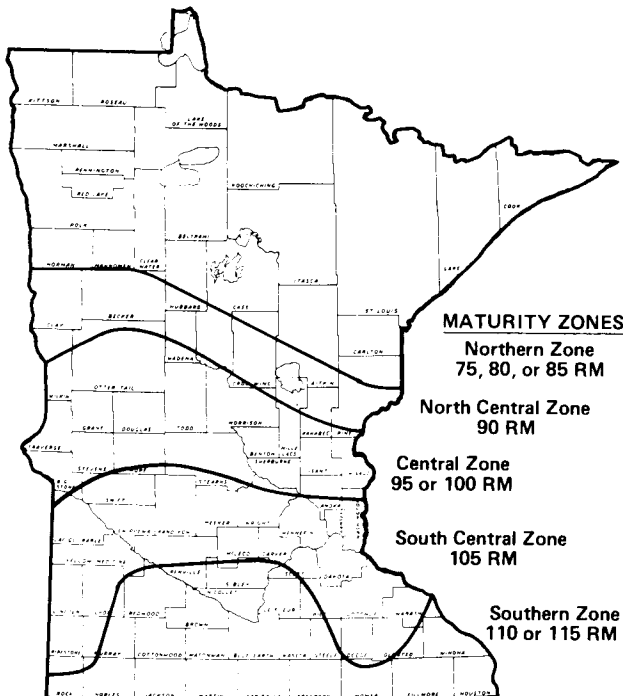
## OTHER VARIETIES

**Heracles** — High yield, late and tall. Good lodging resistance. Large, broad heads and large seed. Selected from the Dutch variety Spaans. Released in Holland in 1974.

Table 13. Characteristics of annual canarygrass varieties

Variety	Grain yield/A (pounds)			Test weight/bushel (pounds)	Averages — Rosemount, Stephen, Crookston				
	1975-76	Stephen 1975-76	Crookston 1976		Weight/100 seeds (grams)	Planting to heading (days)	Planting to mature (days)	Lodging (score) <sup>1</sup>	Height (inches)
Alden	781	1275	1525	46.9	.71	61	112	4.2	33
Heracles	413	1232	1397	43.1	.79	63	114	3.2	32
LSD 5%	106	150	148						

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



# CORN

Many corn hybrids are produced by private plant breeders. Information on the performance of these closed-pedigree or private hybrids is usually available from the individuals or companies selling them. The Minnesota Agricultural Experiment Station does not conduct performance trials of most private hybrids, but does develop and test open-pedigree or public hybrids. Those public hybrids developed by the Minnesota Agricultural Experiment Station are called Minhybrids. Minhybrids are produced and offered for sale by private growers.

The relative maturity ratings (RM) listed in table 12 correspond to zones of adaptation shown in the accompanying map. Yield and stalk breakage data reported in the table are from replicated, hand-harvested, single row plots. The plant population was approximately 21,000 plants per acre.

Table 14. Performance of corn hybrids

Hybrid	Type of cross	Relative maturity	Yield per acre <sup>1</sup> (bushels)						Broken stalks <sup>2</sup> (percent)					
			Crook-		Morris	Rose-	Lamber-	Waseca	Crook-		Morris	Rose-	Lamber-	Waseca
			ston	Staples <sup>6</sup>					ston	Staples <sup>6</sup>				
1974-75	1975-76	1972-75	1975	1975	1972-75	1974-75	1975-76	1972-75	1975	1975	1972-75	1975		
Minhybrid 8301	3-way	80	110	114	113				4	4	8			
Minhybrid 8201	single	80	117	120	121 <sup>5</sup>				8	5	14 <sup>5</sup>			
Minhybrid 806	double	85	111	99					9	3				
Minhybrid 7301	3-way	90		122	127	150	81	118 <sup>4</sup>		1	6	3	4	8 <sup>4</sup>
Minhybrid 6304	3-way	95			124 <sup>4</sup>	153	86	142 <sup>3</sup>			1 <sup>4</sup>	1	3	1 <sup>3</sup>
Minhybrid 6301	3-way	95			127	144	84	129			5	2	5	12
Minhybrid 621	double	95			117 <sup>3</sup>	129					6 <sup>3</sup>	2		
Minhybrid 613	double	95			121 <sup>3</sup>	135					3 <sup>3</sup>	4		
M309	3-way	100			137 <sup>3</sup>	165	108	138 <sup>3</sup>			4 <sup>3</sup>	6	8	11 <sup>3</sup>
Minhybrid 5302	3-way	105						134 <sup>5</sup>						16 <sup>5</sup>
Minhybrid 5301	3-way	105					109	134					2	17
Minhybrid 5201	single	105					115	146					3	19
Minhybrid 4301	3-way	110					97	132 <sup>3</sup>					0	11 <sup>3</sup>
Minhybrid 4201	single	110					108	148					4	11
Minhybrid 417	double	110					105	131 <sup>4</sup>					2	13 <sup>4</sup>
LSD 5%			10	13	6	14	17	11	5	5	7	9	6	8

<sup>1</sup> 15.5% moisture basis.<sup>2</sup> Below ear.<sup>3</sup> 1975.<sup>4</sup> 1974-75.<sup>5</sup> 1973-75.<sup>6</sup> Irrigated.

## GRAIN SORGHUM

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

Trials were planted between May 21 and June 3 at the rate of 150,000 seeds per acre in rows 30 inches apart. Sorghum was

harvested when it was dry enough to combine but not dry enough to store without artificial drying. Consequently, these trials do not measure lodging that might occur during natural drying in the field. All hybrids were harvested the same day for relative moisture comparisons. Hybrids in the table are ranked from earliest to latest based on head moisture at harvest. Data for varieties not tested for 5 years are adjusted to be comparable with 1972-76 data.

Table 15. Characteristics of grain sorghum hybrids at Lamberton, 1972-76

Hybrid and originator	Years of trial	Grain yield/acre (pounds) <sup>1</sup>		Head moisture <sup>2</sup> (percent)		Test weight/ bushel <sup>2</sup> (pounds)	Weight/ 100 seeds <sup>2</sup> (grams)	Planting to heading (days)	Height (inches)
		1972-76 <sup>2</sup>	1976	September 13	October 2				
1, Minnesota	1972-76	4097	2935	29.4	19.2	55.9	2.2	60	54
200, Pride	1975-76	3260	2220	30.4	19.7	53.8	2.2	59	44
52, Northrup, King	1973-76	3805	2598	35.1	20.1	55.6	1.7	61	39
RS 455, Minnesota	1972-76	4704	3310	35.7	20.9	57.0	2.3	64	54
R-920, Acco	1972, 75-76	4880	3821	41.1	22.2	56.4	1.8	65	47
894, Pioneer	1972-76	4527	3764	39.9	22.3	56.8	1.8	66	40
121, Northrup, King	1972-76	4349	3500	38.3	22.5	55.5	2.0	67	44
8901, Pioneer	1972-76	4173	3919	40.3	22.5	51.2	1.9	67	41
33A, Jacques	1976	4399	3506	49.5	25.6	57.2	2.0	74	45
1580, Northrup, King	1976	4930	4037	45.1	25.7	56.3	1.9	71	47
129, Northrup, King	1973-76	5232	4159	44.1	25.8	58.4	2.4	69	46
101, Jacques	1976	4319	3426	45.6	26.4	55.2	2.2	71	47
A25a DeKalb	1975-76	4912	4064	45.8	26.4	54.8	2.3	68	39
180, Northrup, King	1972-76	4840	3900	47.7	28.1	57.3	2.0	72	48
44, Jacques	1976	3466	2573	49.8	29.3	54.2	1.8	85	42
LSD 5%		402	822	2.6	1.5				

<sup>1</sup> Oven-dry moisture basis.<sup>2</sup> 1974 data not used because birdfeeding loss affected varietal comparisons.

# BUCKWHEAT

Buckwheat is cross-pollinated and very little certified seed is available. Consequently, variety designations may not be valid except for the few available certified seedlots. Since 1972, only Pennquad, Tempest, and Tokyo have been certified in the United States.

Trials at Rosemount from 1960 to 1969 failed to show consistent superiority of named varieties over good common buckwheat. Therefore, variety recommendations have not been made.

Trials at Elk River and Becker were conducted on infertile sandy soil; drought accounts for the low yields.

**Common** — Medium size seed. Diploid.

**Giant American** — Large seed. Diploid.

**Mancan** — Large seed. Diploid. Selected by Agriculture Canada, Morden, from common buckwheat. Licensed in 1974.

**Pennquad** — Very large seed. Tetraploid. Should probably be isolated from diploid varieties. Good lodging resistance. Released by Pennsylvania Agricultural Experiment Station in 1966.

**Tempest** — Small seed. Diploid. Selected by Agriculture Canada from a Russian seedlot. Licensed in 1971.

**Tokyo** — Small seed. Diploid. Originated by Agriculture Canada from a Japanese introduction. Released in 1955.

Table 16. Characteristics of buckwheat varieties at Elk River in 1974-75 and at Becker in 1976

Variety	Seed yield/acre (pounds)	Test weight/bushel (pounds)	Weight/100 seeds (grams)	Height (inches)	Lodging (score) <sup>1</sup>	Planting to bloom (days)
Common	727	45.1	2.5	35	3.0	31
Giant American	634	39.3	3.1	37	3.5	35
Mancan	643	41.6	2.9	36	3.4	34
Pennquad	382	41.1	3.4	35	2.1	30
Tempest	505	46.6	2.1	38	4.3	33
Tokyo	587	45.4	2.2	35	3.2	33
LSD 5%	81					

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

# FLAX

## RECOMMENDED VARIETIES

**Culbert** — Very high yield. Early, brown seed, blue flowers. High oil percent and very high iodine value. Resistant to rust, very resistant to wilt, moderately susceptible to pasmo. Released in 1975 by Minnesota Agricultural Experiment Station from a cross of Windom and Bison 70.

**Linott** — Very high yield. Early, brown seed, blue flowers. High oil percent and iodine value. Resistant to rust (has a trace of susceptible plants), moderately susceptible to wilt and pasmo. Licensed in 1967 by Agriculture Canada, Ottawa, from crosses involving 770B, Argentine C, Arrow, and C.I. 974.

**Norstar** — High yield. Medium-late, resistant to lodging, brown seed, blue flowers. High oil percent, medium to low iodine value. Moderately susceptible to rust (exhibits some field tolerance to current races), resistant to wilt, moderately resistant to pasmo. Released in 1969 by Minnesota Agricultural Experiment Station from a cross of Redwood and Crystal.

## VARIETIES NOT ADEQUATELY TESTED

**Dufferin** — High yield. Late, brown seed, blue flowers, variable plant height. Medium oil percent. Resistant to rust and wilt. Licensed in 1975 by Agriculture Canada, Ottawa from a cross of Redwood 65 and FP 441.

## OTHER VARIETIES

**Arny** — Medium to low yield. Late, brown seed, blue flowers, resistant to lodging. Medium oil percent, high iodine value. Susceptible to rust, resistant to wilt, moderately resistant to pasmo. Released in 1958 by Minnesota Agricultural Experiment Station from a cross of Crystal and Redson.

**B-5128** — Medium yield but low in yield when sown late. Late, brown seed, blue flowers. Medium oil percent, low iodine

value. Susceptible to rust, moderately susceptible to both wilt and pasmo. Contains a mixture of types including a small percentage of yellow-seeded plants and rust-susceptible plants. Released in 1943 by North Dakota Agricultural Experiment Station from a cross of Golden and Rio.

**Foster** — Low yield, especially when sown late. Medium-late, yellow seed, dark blue flowers. Very high oil percent, medium iodine value. Immune to rust, moderately resistant to wilt and pasmo. Released in 1969 by North Dakota Agricultural Experiment Station from a cross of C.I. 1665 and Minerva.

**Nored** — High yield, especially when sown early. Late, brown seed, blue flowers, resistant to lodging. More tolerant of herbicides MCPA and Dalapon than other commercial varieties. High oil percent, medium iodine value. Moderately susceptible to rust (exhibits some field tolerance to current races), resistant to wilt and pasmo. Released in 1968 by Minnesota Agricultural Experiment Station from an irradiated population of a cross of B-5128 and Redson.

**Raja** — Low yield. Very early maturity, brown seed, blue flowers. Height and appearance changes from early to late sowing. Very low oil percent and iodine value. Resistant to rust, moderately susceptible to wilt, susceptible to pasmo. Released in 1954 by Agriculture Canada, Ottawa from crosses involving Arg. M.S., F.G. 1025, and JWS 15339.

**Summit** — Very high yield. Early, brown seed, blue flowers. Medium to low oil percent, high iodine value. Susceptible to rust, resistant to wilt, and moderately susceptible to pasmo. Released in 1964 by South Dakota Agricultural Experiment Station from a cross of B-5128 and Zenith.

**Windom** — Very high yield whether sown early or late. Early, brown seed, blue flowers. Medium oil percent, high iodine value. Susceptible to rust, resistant to wilt, and moderately susceptible to pasmo. Released in 1962 by Minnesota Agricultural Experiment Station from crosses involving Renew, Bison, Koto, Redwing, and Redwood.

Table 17. Yields of flax varieties in bushels per acre, 1975-76

Variety	Early-sown						Late-sown			
	Morris 1975	Lamberton 1975-76	Crookston 1975-76	Stephen 1975-76	Grand Rapids 1975-76	Average 1975-76	Morris 1975	Lamberton 1975	Crookston 1975	Average 1975
Culbert	32	19	20	29	30	26	17	26	12	18
Linott	28	19	24	32	25	26	16	21	17	18
Norstar	30	17	23	29	25	25	20	14	15	16
Dufferin	38	19	23	30	22	26	20	20	17	19
Nored	32	17	23	29	23	25	17	15	19	17
LSD 5%	4	4	5	4	6	4	6	5	5	5

Table 18. Characteristics of flax varieties, 1975-76

Variety	Days from sowing to		Height (inches)	Lodging (score) <sup>1</sup>	Wilt (score) <sup>1</sup>	Chlorosis (score) <sup>1</sup>	Rust <sup>2</sup>	Oil (percent)
	First bloom	Full bloom						
Culbert	45	50	21	2	1	4	R	40.4
Linott	45	50	21	2	7	3	R	40.2
Norstar	48	54	24	3	4	2	MS	39.4
Dufferin	49	56	23	2	4	1	R	40.6
Nored	48	56	24	2	3	3	S	39.9

<sup>1</sup> 1 = best, 9 = poorest.

<sup>2</sup> Reaction to race 371: R = resistant; S = susceptible; MS = moderately susceptible.

## SOYBEANS

Information on soybeans is presented in two sections. The first section deals with varieties that have been developed and released by publicly supported institutions and that are considered for recommendation by the Minnesota Agricultural Experiment Station. The second section deals primarily with privately developed varieties, although several public varieties are included for comparison. These private varieties are not considered for recommendation because only those submitted voluntarily by their owners were tested, and the experiment station does not have adequate long-time data (3 years or more) on many of them.

### PUBLICLY DEVELOPED VARIETIES

Yield data reported in table 19 are averages of two or more years. The data for Crookston, Moorhead, Morris, St. Paul, Lamberton, and Waseca are from replicated combine-harvested plots. Data from Grand Rapids, the Sand Plain, and Fairmont are from replicated multiple-row nursery plots. The Sand Plain plots were at Elk River in 1974 and 1975 and at Becker in 1976 and were irrigated all three years. The row spacing was 24 inches at Grand Rapids; 28 in 1972 and 1973 and 22 in 1974, 1975, and 1976 at Crookston; and 22 in 1972, 1974, and 1976, and 28 in 1973 and 1975 at Moorhead. At all other locations the spacing was 30 inches. At all locations, seeding rate was about 10 viable seeds per foot of row. The majority of the tests in all years were planted from May 5 to May 30. However, the early plantings at Waseca and Lamberton were usually during the last week of

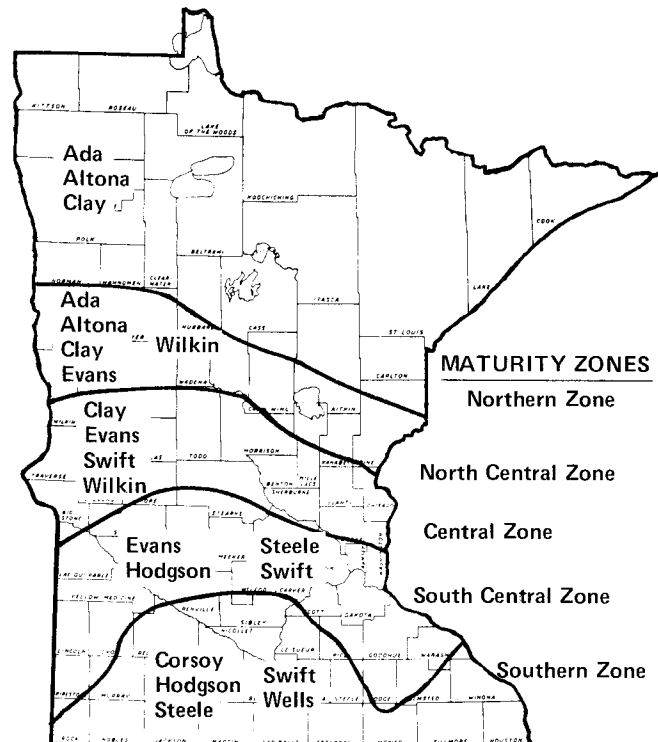


Table 19. Yields of publicly developed soybean varieties in bushels per acre

Variety	Crookston 1972-76	Grand Rapids 1970-76	Moorhead 1974-76	Morris 1973-75	Sand Plain <sup>1</sup> 1974-76	St. Paul 1975-76	Lamberton			Waseca				Fairmont 1975-76
							Early planting date 1975-76	Normal planting date 1975-76	Early July planting date 1972-76 <sup>2</sup>	Early planting date 1975-76	Normal planting date 1975-76	Mid-June planting date <sup>3</sup> 1975-76	Early July planting date 1972-76	
<b>Early-maturing group</b>														
Fiskeby V		19												
Ada	22	30	23	26				19					26	
Altona	22	32	23	25				18					26	
Clay	26	33	27	31				20					29	
Wilkin	27	34	26	27				18					29	
LSD 5%	2	2	2	2				2					1	
<b>Medium-maturing group</b>														
Clay			25	29	49	31						37		
Wilkin					47									
Evans			29	32	52	37		16		37	37			44
Grande			23	31	49	38		21		40				42
Harlon					50	34		14		39				44
Swift			24	33	50	35		17		42	34			44
Chippewa 64					30	45		22		41				42
Hodgson					35	54		40		46	35			45
Steele					33	48		37		41	34			44
LSD 5%			2	2	3	3		2		4				3
<b>Late-maturing group</b>														
Hodgson							22	25		41	44			49
Corsoy							23	27		40	44	32		47
Harcor														45
Wells							21	26		40	42	30		45
LSD 5%							2	4		1	2	3		5

<sup>1</sup> Irrigated; Elk River 1974-75, Becker 1976.

<sup>2</sup> No data in 1974.

<sup>3</sup> All varieties in same test; LSD shown in late group.

Table 20. Characteristics of publicly developed soybean varieties

Variety	Mature (date)	Lodging resistance (score) <sup>1</sup>	Plant height (inches)	Weight of 100 seeds (grams)	Seed quality (score) <sup>1</sup>	Protein (percent) <sup>2</sup>	Oil (percent) <sup>2</sup>	Phytophthora (reaction) <sup>3</sup>	Chlorosis (score) <sup>1</sup>	Flower (color) <sup>4</sup>	Pubescence (color) <sup>4</sup>	Hilum (color) <sup>4</sup>
<b>Early-maturing group (average of Crookston and Grand Rapids, 1972-76)</b>												
Fiskeby V	9-6	1.2	19	16.4	2.1	—	—	S	2.8	P	T	Br
Ada	9-16	2.0	32	16.4	2.8	39.7	19.7	R	1.3	W	G	Y
Altona	9-16	1.8	30	17.8	2.8	39.7	19.7	R	3.0	P	T	Bl
Clay	9-20	1.6	30	15.3	2.8	38.6	21.6	S	1.8	P	G	Y
Wilkin	9-20	1.4	31	14.2	2.6	38.3	20.5	R	1.6	W	G	Y
<b>Medium-maturing group (average of Morris and St. Paul, 1975-76)<sup>5</sup></b>												
Clay	9-1	1.7	25	16.0	2.5	37.6	22.7	S	1.5	P	G	Y
Wilkin	9-2	1.2	25	15.5	2.3	37.0	22.0	R	1.4	W	G	Y
Evans	9-7	1.3	31	15.6	2.1	37.0	22.7	R	1.8	W	G	Y
Grande	9-13	1.8	28	20.9	2.6	35.4	20.8	S	2.5	P	T	Y
Harlon	9-15	2.0	35	15.4	2.2	35.4	22.2	R	1.9	W	G	Y
Swift	9-13	2.7	33	14.8	2.3	34.9	22.0	S	1.2	W	T	Bl
Chippewa 64	9-14	1.9	32	13.8	2.1	38.4	20.2	R	2.2	P	T	Bl
Hodgson	9-18	2.0	32	15.2	2.0	35.8	22.2	S	1.5	P	G	Bf
Steele	9-18	2.0	35	16.9	2.3	37.8	20.6	R	2.3	P	G	Y
<b>Late-maturing group (average of Lamberton and Waseca, 1974-1976)</b>												
Hodgson	9-14	1.0	28	14.8	1.8	37.2	23.0	S	1.5	P	G	Bf
Corsoy	9-18	1.4	32	13.4	2.0	38.6	20.8	S	2.5	P	G	Y
Harcor	9-19	1.6	34	13.2	2.0	38.5	20.9	R	2.3	P	G	Y
Wells	9-19	1.0	34	14.0	2.4	39.4	20.6	R	2.1	P	G	Ib

<sup>1</sup> 1 = excellent, 5 = very poor.

<sup>2</sup> Moisture-free basis; no 1976 data.

<sup>3</sup> R = resistant, S = susceptible.

<sup>4</sup> Flower color: P = purple, W = white; pubescence color: G = gray, T = tawny; hilum color: Bf = buff, Bl = black, Br = brown, Ib = imperfect black, Y = yellow.

<sup>5</sup> Morris data for 1975 only.



April, and the very late plantings at these locations were usually during the first week of July. A mid-June planting also was made at Waseca in 1975 and 1976.

Varieties are placed in three maturity groupings. Certain transitional varieties appear in more than one grouping. Comparisons should be made only within a grouping because varying numbers of years or plot locations may be involved between groupings.

Data on maturity, lodging resistance, plant height, seed size, and seed quality in table 20 are from locations suited to particular maturity groups. Phytophthora reactions were determined by University of Minnesota's Department of Plant Pathology. Chlorosis scores were obtained from plantings at Crookston and on a high-lime soil near Lamberton. Protein and oil determinations were made at the U.S. Regional Soybean Laboratory, Urbana, Illinois.

From the standpoint of maturity, soybean varieties have a narrow range of adaptation. The accompanying map relates Minnesota production areas to varietal recommendations in the text.

### RECOMMENDED VARIETIES

**Ada** — Northern and north central zones. Excellent seedling vigor. Resistant to phytophthora. Good tolerance to high-lime soils. Developed at Minnesota Agricultural Experiment Station from a cross of Merit and Norman. Released in 1972.

**Altona** — Northern and north central zones. Resistant to phytophthora. Developed at University of Manitoba from a cross of P.I. 194654 and Flambeau. Released in 1966.

**Clay** — North central, central, and northern zones. Outstanding in yield and oil content in its maturity class. Rather highly susceptible to phytophthora. Developed at Minnesota Agricultural Experiment Station from a cross of Renville and Capital. Released in 1968.

**Corsoy** — Southern zone. Outstanding in yield among the later-maturing varieties. Medium resistance to lodging. Occupied a large part of the soybean acreage in southern Minnesota in recent years. Developed at Iowa Agricultural Experiment Station from a cross of Harosoy and Capital. Released in 1967.

**Evans** — North central, central, and south central zones. Has performed well in southern zone also. Resistant to phytophthora. Developed at Minnesota Agricultural Experiment Station from a cross of Merit and Harosoy. Released in 1974. Seed sale regulated by U.S. Variety Protection Act.

**Hodgson** — South central and southern zones. Outstanding in yield in its maturity class. Good resistance to lodging. Tolerant to high-lime soils. High oil content. Susceptible to phytophthora. Developed at Minnesota Agricultural Experiment Station from crosses involving Corsoy, Lincoln, Richland, and P.I. 180501. Seed sale regulated by U.S. Variety Protection Act.

**Steele** — South central and southern zones. Resistant to phytophthora. Developed at Minnesota Agricultural Experiment Station from a cross of Blackhawk and Harosoy. Released in 1972.

**Swift** — South central, central, and southern zones. Very good tolerance to high-lime soils. Fair resistance to lodging. Susceptible to phytophthora. Developed at Minnesota Agricultural Experiment Station from crosses involving Lincoln, Richland, Capital, and Korean. Released in 1972.

**Wells** — Southern zone. Similar in maturity to Corsoy. Yields less than Corsoy, but has greater resistance to lodging and has resistance to phytophthora. Developed at Indiana Agricultural Experiment Station from crosses involving Harosoy, Lincoln, Ogden, and Blackhawk. Released in 1972. Seed sale regulated by U.S. Variety Protection Act.

**Wilkin** — Central and north central zones. Excellent resistance to lodging. Resistant to phytophthora. Good tolerance to high-lime soils. Developed at Minnesota Agricultural Experiment Station from a cross of Merit x Harosoy. Released in 1972.

### VARIETIES NOT ADEQUATELY TESTED

**Coles** — Taller, lodges more, and several days later than Hodgson. Susceptible to phytophthora. Developed by the Iowa Agricultural Experiment Station from crosses involving Hark, Provar, Magna, and Disoy. Released in 1976.

**Harcor** — Similar to Corsoy in many respects but resistant to phytophthora. Developed by Agriculture Canada, Harrow, Ontario, from crosses involving Corsoy and Harosoy 63. Licensed in 1975.

**Harlon** — Similar to Swift in maturity. Resistant to phytophthora. Developed by Agriculture Canada, Harrow, Ontario from a cross of Blackhawk and Harosoy 63. Licensed in 1975.

### OTHER VARIETIES

**Amsoy** — Several days later than Corsoy and has yielded less. Susceptible to phytophthora. Selected at Iowa Agricultural Experiment Station from a cross of Adams and Harosoy. Released in 1965.

**Amsoy 71** — Similar to Amsoy, but resistant to phytophthora. Developed by backcrossing at Indiana Agricultural Experiment Station. Released in 1971. Seed sale regulated by U.S. Variety Protection Act.

**Anoka** — Similar to Chippewa 64 in maturity. Yields more but lodges more than Chippewa 64. High oil content. Large seed. Susceptible to phytophthora rot and very susceptible to chlorosis on high-lime soils. Developed at Minnesota Agricultural Experiment Station from crosses involving Lincoln, Richland, and Korean. Released in 1970.

**Chippewa and Chippewa 64** — Chippewa was selected at the U.S. Regional Soybean Laboratory from crosses involving Lincoln and Richland. The phytophthora-resistant Chippewa 64 was developed by backcrosses in which Chippewa was the recurrent parent and Blackhawk was the resistant, non-recurrent parent. Chippewa and Chippewa 64 were very important in Minnesota soybean production for two decades. Recently they have been superseded by higher yielding varieties. Chippewa was released in 1955, Chippewa 64 in 1964.

**Fiskeby V** — An extremely early maturity variety which was developed by the Holmberg Seed Company of Norrkoping, Sweden. Tolerant of relatively low summer temperatures.

**Grande** — A large seeded variety which is similar in maturity and yield to Swift. *Of special interest to some of the food industries because of its large seed size and colorless hilum. A market for this variety should probably be negotiated before it is grown.* Susceptible to phytophthora. Relatively low in both oil and protein. Developed at the Minnesota Agricultural Experiment Station from a cross of Anoka and Magna. Released in 1976.

**Hark** — Slightly earlier than Corsoy and more resistant to lodging. Yields less than Corsoy. Susceptible to phytophthora. Very susceptible to chlorosis on high-lime soils. Developed at Iowa Agricultural Experiment Station from a cross of Hawkeye and Harosoy. Released in 1966.

**Merit** — Similar to Evans in maturity, height, and resistance to lodging but yields less. Resistant to phytophthora. Developed by Agriculture Canada from a cross of Blackhawk and Capital. Released in 1959.

**Norman** — Similar to Ada in maturity, yield, height and lodging. Susceptible to phytophthora. Developed at Minnesota Agricultural Experiment Station from a cross of Acme and Hardome. Released in 1969.

**Ottawa Mandarin** — Similar to Swift in maturity, but yields less. Highly resistant to lodging. Susceptible to phytophthora and chlorosis on high-lime soils. Selected by Agriculture Canada, Ottawa, from the variety Mandarin. Released in 1945.

**Traverse** — Similar to Chippewa 64 in yield but several days earlier. Susceptible to chlorosis on high-lime soils. Highly susceptible to phytophthora. Developed at Minnesota Agricultural Experiment Station from a cross of Lincoln and Ottawa Mandarin. Released in 1945.

## PRIVATELY DEVELOPED VARIETIES

A group of varieties considered "early" by the companies submitting them was planted in replicated tests at Becker, Morris and Rosemount in 1976. A later group was planted at Fairmont, Lamberton, and Waseca. The tests at Lamberton and Morris were not harvested because of very poor stands resulting from early season drought. The Becker and Rosemount tests were irrigated several times during the summer.

All tests in all years were planted in four-row plots, 12 feet long with 30-inch spacings between rows. There were three replications at all locations except Becker, where there were four. Eight feet of each of the two interior rows were harvested for yield. Planting dates varied in the several years, but fell between May 5 and May 25. Seeding rate in all tests was about 10 viable seeds per foot of row.

Yields of the early group of varieties for 1976 and for longer periods are given in table 21. Yields for the late group are given in table 22. The varieties are arranged in two sections with the publicly developed varieties first and the privately developed varieties second. Each section is arranged alphabetically.

Other characteristics for 1976 are given in tables 23 and 24 for the late and early groups, respectively. For several of the characteristics, an average is shown for both locations within a group. The phytophthora reactions are from laboratory tests made by the Department of Plant Pathology.

The companies entering varieties in the 1976 Minnesota tests along with mailing addresses are as follows: ACCO Seed Co., 216 South 5th Street, St. Peter, MN 56082; Americana Seeds, Inc., R.R. 1, Clinton, WI 53525; Asgrow Seed Co., 634 East Lincolnway, Ames, IA 50010; Dale Ewing, Jewell, IA 50130; FFR Cooperative, 4112 East State Road 225, West Lafayette, IN 47906; Helena Chemical Co., P.O. Box 636, Des Moines, IA 50303; Jacques Seed Co., Prescott, WI 54021; Kruger Seed Co., R.R. 4, Cedar Falls, IA 50613; Land O'Lakes, Inc., Research Farm, R.R. 2, Webster City, IA 50595; North American Plant

Breeders, P.O. Box 2955, 5201 Johnson Drive, Mission, KS 66205; Northrup, King and Co., P.O. Box 49, Washington, IA 52353; Pfizer Genetics Inc. (Clemens Seed) Beaman, IA 50609; Pioneer Hi-Bred International, Inc. (Peterson Soybean Seed Division), 3261 West Airline Highway, Waterloo, IA 50609; Pride Co., Inc., Glen Haven, WI 53810; Soybean Research Foundation, Inc., P.O. Box 72, 115 N. Perry St., Mason City, IL 62664; and Ziller Seed Farms, Inc., Bird Island, MN 55310.



Agronomist J.W. Lambert compares Ada and Altona which are the earliest maturing of the recommended soybean varieties.

Table 21. Yields of private soybean varieties in bushels per acre, early group, 1976 and period averages

Company	Brand and/or variety	Becker <sup>1</sup>	Morris	Rosemount <sup>1</sup>		
		1976	1974-75	1976	1975-76	1974-76
	Chippewa 64	34	34	40	43	37
	Evans	45	34	50	48	45
	Harlon	42	35	45	44	41
	Hodgson	46	38	52	50	45
	Steele	46	31	47	47	42
	Swift	48	32	48	48	44
Americana Seeds, Inc.	105	39		52		
Americana Seeds, Inc.	XK 140	40		43		
Asgrow Seed Co.	XP 1564	46		49		
FFR Coop.	FFR 111	— <sup>2</sup>		34		
Helena Chem. Co.	Wilstar 110	39		42		
Helena Chem. Co.	Wilstar 125	— <sup>2</sup>		39		
Jacques Seed Co.	J74-712-1	42		45		
Jacques Seed Co.	J94	41	33	47	46	41
N.A. Plant Breeders	Agripro 1235	42	32	46	46	40
N.A. Plant Breeders	Agripro Ex 50136	47		48		
N.A. Plant Breeders	Agripro Ex 50137	45		52		
Northrup, King & Co.	S1244	45	36	46	45	40
Pioneer Hi-Bred, Inc.	Peterson 85	44	31	48	48	44
Pioneer Hi-Bred, Inc.	Peterson 118-11	39		41	45	
Pride Co. Inc.	Pride B186	42		45		
Soybean Res. Found. Inc.	SRF 100	45	34	46	44	40
Soybean Res. Found. Inc.	SRF 70-38 Exp.	48		45		
Ziller Seed Farms Inc.	86R	— <sup>2</sup>		41		
LSD 5%		6	5	6	3	3

<sup>1</sup> Irrigated

<sup>2</sup> Very late maturity, plots inadvertently destroyed before harvest.

Table 22. Yields of private soybean varieties in bushels per acre, late group, 1976 and period averages

Company	Brand and/or variety	Fairmont			Waseca			Average, Fairmont and Waseca			Lamberton
		1976	75-76	74-76	1976	75-76	74-76	1976	75-76	74-76	1974-75
	Chippewa 64	37	44	43	39	41	40	38	43	41	31
	Corsoy	34	47	47	43	48	43	38	48	45	33
	Harcor	40	49		44	46		42	47		
	Hodgson	47	52	51	51	49	46	49	51	48	33
	Wells	43	51	47	37	46	43	40	48	45	34
ACCO Seed Co.	201	47			39			43			
Americana Seeds, Inc.	XK 125	36	44	44	38	43	41	37	44	37	31
Americana Seeds, Inc.	240	36			34			35			
Americana Seeds, Inc.	245	37			27			32			
Asgrow Seed Co.	A2340	42	48	50	46	47	42	44	48	46	35
Asgrow Seed Co.	A2440	42	52	51	45	50	44	44	51	47	37
Asgrow Seed Co.	A2656	38			47			42			
Asgrow Seed Co.	XP1564	40			41			41			
Asgrow Seed Co.	XP2376	41			43			42			
Dale Ewing	Mora-Soy 55	41			46			43			
Dale Ewing	Mora-Soy 60	41			40			41			
FFR Coop.	FFR 111	36	42	43	36	40	36	36	41	39	30
FFR Coop.	FFR 223	40			32			36			
Helena Chem. Co.	Wilstar 110	40			34			37			
Helena Chem. Co.	Wilstar 125	36			34			35			
Helena Chem. Co.	Wilstar 225	36			46			41			
Helena Chem. Co.	Wilstar 230	37			43			40			
Jacques Seed Co.	J98	40	49	49	42	46	42	41	47	45	34
Jacques Seed Co.	J102	37			39			38			
Jacques Seed Co.	J104	44	49	49	44	44	39	44	46	44	34
Kruger Seed Co.	DeSoy 222	40	49		42	48		41	48		
Kruger Seed Co.	DeSoy 333A	38			47			42			
Kruger Seed Co.	DeSoy 433	43			45			44			
Kruger Seed Co.	K364	33			35			34			
Kruger Seed Co.	K464	41			46			44			
Land O'Lakes, Inc.	G044	44	48	48	46	49	44	45	48	46	34
Land O'Lakes, Inc.	LL4301	33	43		41	44		37	43		
Land O'Lakes, Inc.	LLA43	39			40			39			
N.A. Plant Breeders	Agripro 1235	38	45	46	43	42	42	40	43	44	31
N.A. Plant Breeders	Agripro Ex 50136	39			38			38			
N.A. Plant Breeders	Agripro Ex 50137	39			37			38			
N.A. Plant Breeders	Agripro 14	41	53	50	45	49	45	43	51	48	35
N.A. Plant Breeders	Agripro 18	43			43			43			
N.A. Plant Breeders	NS 220	35			38			36			
Northrup, King & Co.	S 1244	43	43	45	44	44	42	43	43	43	35
Northrup, King & Co.	S 1346	45	48		46	45		45	46		
Northrup, King & Co.	2928 Exp.	39			42			40			
Pioneer Hi-Bred, Inc.	Peterson 85	40	44	45	36	39	39	38	41	42	31
Pioneer Hi-Bred, Inc.	Peterson 118-11	39	48		38	44		39	46		
Pioneer Hi-Bred, Inc.	Peterson 3100	40	48		42	45		41	46		
Pioneer Hi-Bred, Inc.	Peterson 105P	38	44	45	41	45	40	40	44	43	34
Pioneer Hi-Bred, Inc.	Peterson P61-22	37			42			39			
Pfizer Genetics, Inc.	Clemens 12E	42	47		44	44		43	45		
Pfizer Genetics, Inc.	Clemens 2ER-75	41			40			40			
Pfizer Genetics, Inc.	Clemens CX114	38	43		43	45		40	44		
Pfizer Genetics, Inc.	Clemens CX282	41			38			39			
Pfizer Genetics, Inc.	Clemens CX290	31			34			33			
Pride Co., Inc.	Pride B186	39	47		40	44		39	46		
Pride Co., Inc.	Pride B216	43			43			43			
Soybean Res. Found. Inc.	SRF 100	38	44	44	39	41	39	38	43	41	31
Soybean Res. Found. Inc.	SRF 150	42	48	47	45	46	43	44	47	45	31
Soybean Res. Found. Inc.	SRF 200	36	43	44	36	44	38	36	44	41	31
Soybean Res. Found. Inc.	SRF 70-38 Exp.	39			42			40			
Ziller Seed Farm Inc.	86R	34			40			37			
Ziller Seed Farm Inc.	96T	37			43			40			
LSD 5%		8	6	4	7	5	4	5	4	3	5

Table 23. Characteristics of private soybean varieties, late group, average Fairmont and Waseca, 1976

Company	Brand and/or variety	Mature (date)	Lodging resistance (score) <sup>1</sup>	Plant height (inches)	Weight of 100 seeds (grams)	Seed quality (score) <sup>1</sup>	Phytophthora (reaction) <sup>2</sup>	Flower (color) <sup>3</sup>	Pubescence (color) <sup>3</sup>	Hilum (color) <sup>3</sup>
	Chippewa 64	9-5	2.3	35	14.0	2.3	R	P	T	Bl
	Corsoy	9-13	3.1	40	14.4	2.2	S	P	G	Y
	Harcor	9-14	3.0	41	13.8	2.2	R	P	G	Y
	Hodgson	9-7	2.5	35	15.2	2.3	S	P	G	Bf
	Wells	9-14	2.0	42	14.0	2.4	R	P	G	Ib
ACCO Seed Co.	201	9-12	2.2	40	15.5	2.8	H	M	M	M
Americana Seeds, Inc.	XK125	9-14	2.8	40	14.4	2.6	H	M	G	M
Americana Seeds, Inc.	240	9-16	3.2	42	14.6	2.0	H	P	G	Bf
Americana Seeds, Inc.	245	9-26	3.6	44	14.1	2.4	S	W	T	Bl
Asgrow Seed Co.	A2340	9-12	3.2	40	13.8	2.5	H	P	G	Y
Asgrow Seed Co.	A2440	9-13	3.2	42	14.2	2.4	H	P	G	Y
Asgrow Seed Co.	A2656	9-15	3.3	42	15.5	2.5	R	P	G	Ib
Asgrow Seed Co.	XP1564	9-11	3.0	39	15.4	2.5	R	P	G	Y
Asgrow Seed Co.	XP2376	9-16	2.5	42	15.8	2.5	R	P	G	Bf
Dale Ewing	Mora-Soy 55	9-12	2.8	39	14.6	2.2	S	P	G	Y
Dale Ewing	Mora-Soy 60	9-12	2.8	41	14.2	2.5	H	P	G	M
FFR Coop.	FFR 111	9-16	3.2	40	15.2	2.5	H	P	G	Y
FFR Coop.	FFR 223	9-16	3.5	42	15.4	2.5	H	P	G	Y
Helena Chem. Co.	Wilstar 110	9-4	2.6	36	13.4	2.3	R	P	T	Bl
Helena Chem. Co.	Wilstar 125	9-14	3.2	40	13.8	2.6	H	W	G	M
Helena Chem. Co.	Wilstar 225	9-14	3.5	38	13.7	2.4	S	P	G	Y
Helena Chem. Co.	Wilstar 230	9-16	3.2	40	14.3	2.2	S	P	G	Y
Jacques Seed Co.	J98	9-12	2.8	38	14.2	2.5	S	P	G	Y
Jacques Seed Co.	J102	9-12	3.0	36	16.0	2.8	H	P	G	Y
Jacques Seed Co.	J104	9-16	3.3	42	14.6	2.2	H	P	G	Y
Kruger Seed Co.	Desoy 222	9-12	2.8	38	14.9	2.5	H	P	G	M
Kruger Seed Co.	Desoy 333A	9-14	3.2	40	14.6	2.2	S	P	G	Y
Kruger Seed Co.	Desoy 433	9-16	2.6	42	14.3	2.6	H	P	G	Y
Kruger Seed Co.	K364	9-15	3.2	38	15.1	2.5	R	P	G	Y
Kruger Seed Co.	K464	9-15	3.0	40	16.6	2.6	R	P	G	Ib
Land O'Lakes, Inc.	GO 44	9-14	3.2	40	14.5	2.5	S	P	G	Y
Land O'Lakes, Inc.	LL 4301	9-16	3.0	38	17.4	2.2	R	W	G	Y
Land O'Lakes, Inc.	LL A43	9-15	2.8	40	16.4	2.5	R	M	G	M
N.A. Plant Breeders	Agripro 1235	9-10	2.4	34	15.4	2.5	H	P	G	Y
N.A. Plant Breeders	Agripro Ex 50136	9-7	3.0	35	14.7	2.3	R	P	G	Ib
N.A. Plant Breeders	Agripro Ex 50137	9-7	2.5	35	15.2	2.2	R	P	G	Y
N.A. Plant Breeders	Agripro 14	9-12	2.5	38	15.6	3.0	H	M	M	M
N.A. Plant Breeders	Agripro 18	9-14	2.6	39	15.2	2.6	H	M	M	M
N.A. Plant Breeders	NS 220	9-13	3.2	41	14.1	2.5	R	P	T	Gr
Northrup, King & Co.	S1244	9-10	2.5	38	17.2	2.3	S	P	T	Bl
Northrup, King & Co.	S1346	9-10	1.8	35	15.9	2.5	H	P	G	Y
Northrup, King & Co.	2928 Exp.	9-16	2.6	38	14.6	2.6	H	W	G	Bf
Pioneer Hi-Bred, Inc.	Peterson 85	9-6	1.6	28	17.1	2.7	S	P	G	Bf
Pioneer Hi-Bred, Inc.	Peterson 118-11	9-13	2.5	35	15.0	2.2	S	P	T	Br
Pioneer Hi-Bred, Inc.	Peterson 3100	9-13	3.0	40	13.8	2.4	H	P	G	M
Pioneer Hi-Bred, Inc.	Peterson 105P	9-16	3.2	42	14.5	2.5	H	P	G	Y
Pioneer Hi-Bred, Inc.	Peterson P61-22	9-14	2.8	42	13.5	2.5	S	P	G	Y
Pfizer Genetics, Inc.	Clemens 12E	9-6	2.2	35	15.6	2.3	H	P	G	M
Pfizer Genetics, Inc.	Clemens 2ER-75	9-16	2.8	43	14.7	2.5	H	P	G	M
Pfizer Genetics, Inc.	Clemens CX114	9-14	3.2	39	13.5	3.0	H	W	G	M
Pfizer Genetics, Inc.	Clemens CX 282	9-6	2.4	33	14.6	2.5	S	P	T	Bl
Pfizer Genetics, Inc.	Clemens CX290	9-26	3.2	44	13.0	2.2	R	P	T	Br
Pride Co., Inc.	Pride B186	9-11	2.3	36	16.1	2.6	S	P	T	Br
Pride Co., Inc.	Pride B216	9-17	3.2	40	14.2	2.5	H	W	G	Y
Soybean Res. Found., Inc.	SRF 100	9-5	2.5	35	14.5	2.3	R	P	T	Bl
Soybean Res. Found., Inc.	SRF 150	9-12	2.4	36	14.6	2.2	S	P	G	Y
Soybean Res. Found., Inc.	SRF 200	9-17	3.0	44	12.7	2.2	R	P	G	Y
Soybean Res. Found., Inc.	SRF 70-38 Exp.	9-7	1.8	34	19.2	2.3	S	P	G	Y
Ziller Seed Farms Inc.	86R	9-14	3.0	41	14.1	2.5	H	W	G	M
Ziller Seed Farms Inc.	96T	9-17	2.4	40	15.4	2.4	S	W	G	Y

<sup>1</sup> 1 = excellent, 5 = very poor.      <sup>2</sup> H = heterogeneous, R = resistant, S = susceptible.<sup>3</sup> Flower color: P = purple, W = white, M = mixed; pubescence color: G = gray, T = tawny, M = mixed; hilum color: Bf = buff, Bl = black, Br = brown, Gr = gray, Ib = imperfect black, Y = yellow, M = mixed.

Table 24. Characteristics of private soybean varieties, early group, average Becker and Rosemount, 1976

Company	Brand and/or variety	Mature (date)	Lodging resistance (score) <sup>1</sup>	Plant height (inches)	Weight of 100 seeds (grams)	Seed quality (score) <sup>1</sup>	Phytophthora (reaction) <sup>2</sup>	Flower (color) <sup>3</sup>	Pubescence (color) <sup>3</sup>	Hilum (color) <sup>3</sup>
	Chippewa 64	9-14	2.4	38	14.4	2.0	R	P	T	Bl
	Evans	9-10	1.6	34	17.2	2.2	R	W	G	Y
	Harlon	9-14	2.8	34	17.0	2.2	R	W	G	Y
	Hodgson	9-17	2.9	36	17.0	2.0	S	P	G	Bf
	Steele	9-20	3.4	39	17.7	2.0	R	P	G	Y
	Swift	9-12	3.0	36	17.7	2.6	S	W	T	Bl
Americana Seeds, Inc.	105	9-16	3.0	38	14.6	2.8	H	W	G	Bf
Americana Seeds, Inc.	XK140	9-15	2.8	38	14.1	2.0	R	P	T	Bl
Asgrow Seed Co.	XP1564	9-18	3.5	40	17.0	2.0	R	P	G	Y
FFR Coop.	FFR 111	9-24	3.8	44	15.9	2.7	H	P	G	Y
Helena Chem. Co.	Wilstar 110	9-8	2.5	34	14.1	2.0	R	P	T	Bl
Helena Chem. Co.	Wilstar 125	9-24	3.5	43	13.7	2.0	H	W	G	M
Jacques Seed Co.	J74-712-1	9-21	3.5	38	18.5	2.6	R	P	G	Bf
Jacques Seed Co.	J94	9-12	2.9	36	16.8	2.6	H	W	T	Bl
N.A. Plant Breeders	Agripro 1235	9-20	3.4	36	17.1	1.8	H	P	G	Y
N.A. Plant Breeders	Agripro Ex 50136	9-18	3.2	39	16.3	2.2	R	P	G	Ib
N.A. Plant Breeders	Agripro Ex 50137	9-18	3.4	38	16.1	2.0	R	P	G	Y
Northrup, King & Co.	S1244	9-18	3.0	38	17.6	2.4	S	P	T	Bl
Pioneer Hi-Bred, Inc.	Peterson 85	9-12	2.2	32	18.5	2.2	S	P	G	Bf
Pioneer Hi-Bred, Inc.	Peterson 118-11	9-14	2.5	35	15.2	2.0	S	P	T	Br
Pride Co., Inc.	B186	9-20	3.6	40	16.5	2.0	S	P	T	Br
Soybean Res. Found., Inc.	SRF 100	9-11	1.8	34	14.1	1.8	R	P	T	Bl
Soybean Res. Found., Inc.	SRF 70-38 Exp.	9-14	2.4	37	21.0	2.0	S	P	G	Y
Ziller Seed Farms, Inc.	86R	9-25	3.4	42	14.6	2.0	H	W	G	M

<sup>1</sup> 1 = excellent, 5 = very poor.      <sup>2</sup> H = heterogeneous, R = resistant, S = susceptible.

<sup>3</sup> Flower color: P = purple, W = white; pubescence color: G = gray, T = tawny; hilum color: Bf = buff, Bl = black, Br = brown, Ib = imperfect black, Y = yellow.

## SUNFLOWERS



Combine-harvesting the high yielding field of USDA 894 hybrid sunflowers at 1976 Farm Fest near Lake Crystal.

Nonoilseed varieties and hybrids are grown for use as nut-meats, salted whole seed, or birdfeed. Oilseed varieties and hybrids are grown for oil and protein extraction.

Most seed planted in 1977 will be hybrid seed that was produced by the cytoplasmic male-sterility and genetic fertility-restoration method. Names for open-pedigree hybrids in this report are based on the last digits of the parents' names. Single

crosses are named from the last two digits of the female's name and the last digit of the male's name; for example, cms HA 89 X RHA 274 is called 894. For a three-way cross, the last digit of the second parent's name is also shown; for example, (cms HA 89 X HA 234) X RHA 274 is called 8944.

Row widths in these trials were 30 inches, and plant populations were about 20,000 plants per acre for all hybrids.

Table 25. Characteristics of sunflower varieties

Variety and originator	Seed yield/acre (pounds)			Averages – Crookston, Morris, Rosemount					Disease rating <sup>3</sup>			
	Crookston 1976	Morris 1974-76	Morris 1973-75	Large seed (percent) <sup>1</sup>	Oil (percent) <sup>2</sup>	Weight/100 seeds (grams)	Test weight/bushel (pounds)	Planting to bloom (days)	Height (inches)	Rust	Downy mildew	<i>Verticillium</i> wilt
<b>Nonoilseed varieties tested for at least 3 years</b>												
Sundak	1353	1753	1558	32	29.3	10.6	26.5	73	66	R	S	S
850, USDA	1879	1937	1973 <sup>4</sup>	17	29.4	10.8	28.3	71	66	R	S	S
852, USDA	1226	1892	1974	6	32.6	9.3	29.2	70	66	R	S	S
860, USDA	1579	2135	2358 <sup>4</sup>	45	26.2	12.0	26.5	72	67	R	S	S
862, USDA	1576	2060	1528 <sup>4</sup>	11	30.9	9.8	27.5	72	64	R	S	S
882, USDA	1787	2117	1875 <sup>4</sup>	4	32.4	9.8	27.3	69	60	R	S	S
<b>Nonoilseed varieties tested in 1975-76 at Crookston and Rosemount and in 1975 at Morris</b>												
880, USDA	1618	2096	1768	27	28.9	12.2	25.5	73	63	R	S	S
D-508, Dahlgren	1365	2129	2752	4	33.8	9.4	28.2	67	62	R	S	S
D-613, Dahlgren	1480	2136	1851	4	34.0	9.0	27.7	71	65	MR	R,S	S
<b>Nonoilseed varieties tested in 1976 at Crookston and Rosemount</b>												
853, USDA	1304	—	—	15	30.0	9.4	31.7	69	65	R	R	S
863, USDA	1474	—	—	8	34.2	8.1	28.3	73	63	R	R	S
883, USDA	1049	—	—	6	—	9.2	25.8	71	65	R	R	S
920, USDA	1852	—	—	40	28.3	10.9	25.8	72	67	R	S	S
922, USDA	1392	—	—	7	30.3	8.7	26.1	73	62	R	S	S
923, USDA	1813	—	—	20	35.7	9.4	25.7	73	64	R	R	S
D-715, Dahlgren	2062	—	—	11	33.5	10.6	27.5	72	62	R	S	S
D-717, Dahlgren	2283	—	—	13	30.8	9.2	27.1	73	61	R	S	S
<b>Oilseed varieties tested for at least 3 years</b>												
Peredovik 66, U.S.S.R.	1116	1647	1796	0	45.3	5.8	29.1	74	70	MS	S	MS
Sputnik 71, U.S.S.R.	1320	1743	1919	0	47.8	6.0	30.6	72	67	MS	S	MS
891, USDA	1386	1803	1918	0	47.7	4.8	32.7	74	66	MR	R	R
893, USDA	1661	2148	1775 <sup>4</sup>	0	48.1	4.6	33.3	73	64	MR	R	R
894, USDA	1863	2055	2114 <sup>4</sup>	0	45.6	4.2	32.3	73	65	MR	R	R
903, USDA	1902	2074	2242 <sup>4</sup>	0	45.8	5.8	34.1	70	64	R	R	R
904, USDA	1760	2030	2462 <sup>4</sup>	0	43.5	5.0	33.2	72	65	R	R	R
8941, USDA	1815	1899	2154	0	47.2	5.1	34.6	72	68	R	R	R,S
8944, USDA	1570	1943	2190 <sup>4</sup>	0	43.8	4.9	34.2	71	69	MR	R	R,S
Sun-Hi 304, P.O.I.	1693	2139	2041 <sup>4</sup>	0	44.9	4.4	32.7	74	65	MR	R	R
<b>Oilseed varieties tested in 1975-76 at Crookston and Rosemount and in 1975 at Morris</b>												
241, USDA	2319	2320	2243	0	47.6	4.9	33.6	72	64	MR	R	R
243, USDA	1762	2037	2095	0	46.2	5.3	32.3	73	63	MR	R	R
244, USDA	1283	1847	2186	0	43.9	4.5	31.9	73	66	MR	R	R
8903, USDA	1409	1876	2160	0	47.8	5.0	33.4	73	64	R	R	R
204, Cargill	1302	1878	1987	0	45.5	4.2	32.2	74	62	MR	R	R
Sun-Gro 372, G.S.A.	1332	1869	1947	0	45.6	5.0	31.3	75	63	R	S	R
Sun-Gro 380, G.S.A.	1379	1789	2279	0	47.4	5.0	33.7	75	69	MR	R	R
Sunbred 212, NK	1947	1998	2343	0	46.9	5.6	33.7	71	71	MR	R	S
Sunbred 223, NK	1851	2015	2275	0	44.8	6.0	32.2	70	62	R	R	S
<b>Oilseed variety tested in 1974 and 1976 at Crookston and Rosemount and in 1974 at Morris</b>												
Sun-Hi 301, P.O.I.	1162	1669	2121	0	44.4	4.8	32.1	75	67	MR	R	R
<b>Oilseed varieties tested in 1976 at Crookston and Rosemount</b>												
913, USDA	1431	—	—	0	44.6	4.8	33.4	72	56	MR	R	S
914, USDA	1453	—	—	0	44.4	4.6	32.2	74	58	MS	R	S
DO-410, Dahlgren	1740	—	—	0	46.4	6.1	31.3	73	62	R	S	S
DO-714, Dahlgren	1394	—	—	0	40.5	5.8	33.4	70	64	MR	R	S
DO-724, Dahlgren	1607	—	—	0	42.4	5.8	33.7	69	63	MR	R	S
DO-734, Dahlgren	1862	—	—	0	41.3	6.7	33.2	72	69	MR	R	S
604, Jacques	1496	—	—	0	45.0	4.2	31.6	74	62	MR	R	R
Fransol, France	1387	—	—	0	40.7	4.9	31.2	74	57	MS	S	MS
INRA 4701, France	1382	—	—	0	41.8	5.7	28.9	75	64	S	S	MS
INRA 6501, France	1525	—	—	0	38.2	4.6	31.9	73	59	S	S	MS
Sunbred 254, NK	1682	—	—	0	43.3	4.3	33.3	73	63	MR	R	R
LSD 5%	591	299	306									

<sup>1</sup> Held on a 20/64 round-hole screen.<sup>2</sup> Oven-dry basis.<sup>3</sup> Ratings based on known parentage and plot observations but not on controlled tests with the fungi. R = resistant; S = susceptible; MR = moderately resistant; MS = moderately susceptible; R,S = about half of plants resistant. All varieties are susceptible to stem and head rots caused by *Sclerotinia*.<sup>4</sup> Tested at Morris for only 2 years.

## DRY EDIBLE PEAS AND FIELD PEAS

Dry edible peas are sold to processors for use in soup and pigeon feed or fed on the farm to sheep, hogs, or cattle. When used for a forage or feed grain crop, they usually are sown in a mixture with oats.

Varieties with cream-colored seed are most commonly grown. Buyers in Minnesota have not encouraged production of green varieties because of bleaching at harvest time.

### RECOMMENDED VARIETIES

**Century** — High yield. Medium to early. Long vined. Large, cream-colored seed. Good cooking quality. Originated by Agriculture Canada, Ottawa, from crosses involving Chancellor, Early Raymond, and Stirling. Licensed in 1960.

### VARIETIES NOT ADEQUATELY TESTED

**Campbell Scotch** — High yield. Very early. Medium vine length. Medium size, green seed. More resistant to seed bleaching than any green variety tested at Becker in 1976. Selected from crosses involving Alaska, Delwiche Early Scotch, and Thomas Laxton. Released by the Campbell Institute for Agricultural

Research of Davis, CA and Camden, NJ in 1971.

**Finale** — Very high yield. Early. Short. Very large, green seed. Developed by Cebecco - Handelsraad of The Netherlands.

**Latah** — High yield. Early. Long vined. Medium size, cream-colored seed. Originated by Washington Agricultural Experiment Station. Released about 1972.

**Paloma** — Very high yield. Early. Short. Large, cream-colored seed. Developed by Cebecco - Handelsraad of The Netherlands.

### OTHER VARIETIES

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

**Trapper** — Medium to high yield. Medium to early. Medium vine length. Small, cream-colored seed. Good cooking quality. Originated by Agriculture Canada, Morden, from a cross of Chancellor x Weibull's 700. Licensed in 1970.

**Triumph** — High yield. Late. Medium vine length. Very large green seed. Good cooking quality. Selected from P.I. 206852 by Agriculture Canada, Morden. Licensed in 1973.

Table 26. Characteristics of pea varieties on sandy soil, 1974-76

Variety	Seed yield/acre (pounds)			Weight/100 seeds (grams)	Seed protein (percent)	First bloom (date)	Mature (July)	Vine length (inches)
	Dryland	Irrigated	Average					
Century	1222	2096	1659	20.7	25.8	6-14	20	42
Campbell Scotch <sup>1</sup>	1230	2057	1644	15.6	26.2	5-30	3	29
Finale <sup>1</sup>	1103	3134	2118	25.3	25.6	6-9	16	23
Latah	1130	1881	1506	17.1	26.7	6-7	11	41
Paloma <sup>1</sup>	1151	2795	1973	22.5	27.3	6-10	17	24
Triumph	1103	2058	1581	27.7	26.6	6-17	27	28
LSD 5%	210	275	173					

<sup>1</sup> Not tested in 1974-75

## DRY EDIBLE BEANS OR FIELD BEANS

Field beans are combine-harvested as mature dry beans. They are used for human food and reach the grocer's shelf in either canned or dry form. Minnesota farmers often raise beans under contract and buy seed from the contractor.

There are more than 15 market classes of dry, edible beans, but only eight have been grown commercially in Minnesota. Minnesota's 1975 production amounted to 24 percent navy, 72 percent pinto, 1 percent dark red kidney, 2 percent pink, and 1 percent small red. Varietal recommendations are confined to varieties within the navy, small white, pinto, dark red kidney, and great northern classes. Other classes such as pink are grown successfully, but important differences among varieties within their classes have not yet been identified in our trials. The only varieties described in the Not Adequately Tested and Other Varieties groups are those of most current interest and availability.

### RECOMMENDED VARIETIES

**Aurora small white** — Medium yield and maturity. Erect, viny bush. Very small, white seed. Resistant to rust and mosaic V-1, V-15. Tolerant of halo blight. Susceptible to common blight. Developed by New York Agricultural Experiment Station from a cross of Black Turtle Soup and Cornell 49-242. Released in 1973.

**Emerson great northern** — High yield. Medium-late maturity. Large, prostrate vine. Large white seed. Tolerant to bacterial wilt and moderately tolerant to bacterial blight. Susceptible to white mold and rust. Developed by Nebraska Agricultural Experiment Station from a cross of GN 1140 and P.I. 165078. Released in 1971.

**Montcalm dark red kidney** — Medium yield. Late. Large, erect bush. Very large dark red seed. Resistant to mosaic and tolerant to halo blight. Susceptible to white mold, anthracnose, and common and fuscous blights. Named and released by Michigan Agricultural Experiment Station in 1974.

**Seafarer navy** — Medium yield. Early. Erect bush. Small white seed. Resistant to anthracnose and mosaic V-1, V-1A, V-15. Tolerant of halo blight. Susceptible to white mold and common and fuscous blights. Developed by Michigan Agricultural Experiment Station from crosses involving X-ray bush mutants, Emerson 847, Michelite, Trag 279-1, and Florida Belle. Released in 1967.

**UI-114 pinto** — High yield. Medium-late maturity. Large prostrate vine. Tan and brown mottled seed. Resistant to mosaic V-1, V-1A. Tolerant of halo blight. Susceptible to white mold, rust, and common and fuscous blights. Developed by Idaho Agricultural Experiment Station from a cross of UI-111 pinto and J378 great northern. Released in 1965.

## VARIETIES NOT ADEQUATELY TESTED

**Charity navy** — Medium yield. Medium maturity. Medium-size bush. Medium-size white seed. Reported resistant to common mosaic and fuscous blight. Susceptible to white mold, root rot, and common blight. Developed by Clarence Muehlfeld (Bridgeport, Mich.) from a cross of experimental navy strains. Released in 1974.

**Snow-Bunting navy** — Medium yield. Early. Medium-size bush. Small white seed. Reported resistant to common mosaic and root rot. Susceptible to white mold and common and fuscous blights. Developed by Clarence Muehlfeld (Bridgeport, Mich.) from crosses involving Gratiot, Sanilac, Snow-Flake, and experimental navy strains. Released in 1974.

**Snow-Flake navy** — Medium yield. Early. Small erect bush. Small white seed. Reported resistant to common mosaic and fuscous blight. Susceptible to white mold and common blight. Developed by Clarence Muehlfeld (Bridgeport, Mich.) from crosses involving red kidney, Michelite, and experimental navy

strains. Released in 1974.

**Up-Land navy** — Medium yield. Medium maturity. Medium-size bush. Small white seed. Reported resistant to common mosaic and root rot. Susceptible to white mold and common and fuscous blights. Developed by Clarence Muehlfeld (Bridgeport, Mich.) from a cross of Snow-Flake and a navy bean mutation. Released in 1974.

## OTHER VARIETIES

**Gratiot navy** — Medium yield and maturity. Released by Michigan Agricultural Experiment Station in 1963.

**Sanilac navy** — Medium yield. Medium-late maturity. Developed by Michigan Agricultural Experiment Station from crosses involving a bush mutant (X-ray induced) of Michelite and an anthracnose-resistant line. Released in 1956.

**UI-111 pinto** — Lower yield than UI-114 but earlier maturing. Less resistant to mosaic and root rot than UI-114. Developed by Idaho Agricultural Experiment Station from a cross of UI-34 small red and pinto. Released in 1945.

Table 27. Characteristics of field bean varieties

Class and variety	Seed yield/acre (pounds)					Average — 5 locations		
	Becker <sup>1</sup> 1976	Rosemount 1974-75	Lamberton 1974-76	Morris 1974-75	Crookston 1974-76	Yield/acre (pounds)	Weight/100 seeds (grams)	Mature (date)
<u>Pinto</u>								
UI-114	2354	2022	1254	1742	1650	1804	37.4	9-4
UI-111	2265	1529	1196	1652	1851 <sup>2</sup>	1699	36.3	8-31
<u>Navy</u>								
Seafarer	2101	1383	1124	1172	1085	1373	18.4	8-24
Charity	1719	1476	1268	1214	1417	1419	21.8	8-27
Gratiot	1677	1212	1179	890	1194 <sup>2</sup>	1230	18.9	9-1
Kentwood	2011	1920 <sup>2</sup>	1022 <sup>2</sup>	1329 <sup>2</sup>	111 <sup>4</sup>	1279	23.8	9-7
Snow-Bunting	1848	1521	1198	1144	1577	1458	19.6	8-24
Snow-Flake	1722	1267	1077	978	1415	1292	20.0	8-24
Up-Land	1945	1359	1257	1328	1559	1490	18.6	8-27
<u>Small White</u>								
Aurora	1970	1574	1269	1479	—	1573	14.9	8-30
Duty	1428	1477 <sup>2</sup>	1293 <sup>2</sup>	1397 <sup>2</sup>	—	1399	16.3	8-30
Super Bonus	2026	—	1256 <sup>3</sup>	—	—	1538	18.1	9-5
UI-76	1032	1341 <sup>2</sup>	1175	1061	—	1152	16.5	9-1
<u>Great Northern</u>								
Emerson	2557	2163	1424	1840	—	1996	45.0	8-31
Star	2342	—	1409 <sup>3</sup>	—	—	1773	37.7	9-1
UI-59	2077	1727	1194	1632	—	1658	32.9	9-3
UI-61	2067	—	1420 <sup>3</sup>	—	—	1641	30.7	8-27
Valley	2396	1991	1253	1841	—	1870	33.2	9-16
<u>Pink</u>								
Gloria	1505	1619	1393	1616	—	1533	31.2	9-3
Roza	1343	1682	1094	1333	—	1363	30.9	9-5
Sutter	1952	1767	1454	1393	—	1642	27.7	9-5
Viva	1907	1807	1414	1693	—	1705	25.0	9-4
<u>Dark Red Kidney</u>								
Montcalm	1966	1423	839	1422	314 <sup>4</sup>	1193	46.7	9-6
Carmine	2034	1278 <sup>2</sup>	962 <sup>2</sup>	1179 <sup>2</sup>	—	1363	46.4	9-6
<u>Light Red Kidney</u>								
Mecosta	2056	1421	911	1405	—	1448	51.0	9-11
Redkloud	1693	910	705	800	—	1027	45.9	8-27
<u>Small Red</u>								
Rufus	1878	1419 <sup>2</sup>	1233 <sup>2</sup>	1786 <sup>2</sup>	—	1579	31.3	9-5
<u>Black Turtle Soup</u>								
Black Turtle	1720	1675 <sup>2</sup>	1192 <sup>2</sup>	1410 <sup>2</sup>	—	1499	20.2	9-2
Black Turtle T-39	2327	—	1394 <sup>3</sup>	—	—	1758	20.8	9-2
Black Turtle S.V.C.	2022	—	1226 <sup>3</sup>	—	—	1521	20.6	9-3
Jamapa	2169	—	1188 <sup>3</sup>	—	—	1576	20.9	9-2
<u>Marrow</u>								
Idaho Marrow	2023	1475 <sup>2</sup>	1249 <sup>2</sup>	1438 <sup>2</sup>	—	1546	43.7	9-2
LSD 5%	630	252	197	352	180	162		

<sup>1</sup> Irrigated. <sup>2</sup> Not tested in 1974. <sup>3</sup> Not tested in 1974-75. <sup>4</sup> Not tested in 1974, 1976.



# ALFALFA

Many alfalfa varieties are available from both private and public plant breeders. Certified seed should be used because it provides the best assurance of varietal purity and performance. For this reason only varieties for which certified seed is available are listed in this report.

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

The varieties listed in tables 28 and 29 are ranked according to fall growth score, which is an indication of rate of growth and degree of winterhardiness. Very winterhardy varieties are slow to recover after cutting. These varieties will survive nearly all winters. Except for the variety Ramsey they usually are not high yielding because they recover slowly for the second crop and produce only a small third crop because of early dormancy. Winterhardy varieties are adapted to all areas of the state. Forage yields vary among varieties in this group, primarily because of disease and insect resistance. Three or four years of production can be expected from most winterhardy varieties, but a few can be productive for five or more years. Moderately winterhardy varieties usually reach 1/10 bloom several days earlier than more winterhardy varieties. They are also characterized by rapid recovery after harvest.

Nonwinterhardy varieties should not be grown in Minnesota except for plowdown in the seedling year. Varieties in this group are not listed in the tables but include African, Bonanza, Caliente, Caliverde, Caliverde 65, Delta, El-Unico, Florida 66, Hairy Peruvian, Hayden, Joaquin II, Mesa Sirsa, Mesilla, Moapa, Moapa 69, Salton, Sonora, Sonora 70, 183, WL 504, WL 508, WL 600, and Unico.

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

**PHYTOPHTHORA ROOT ROT** — This disease is important on poorly drained soils. It can cause stand losses of seedlings and can contribute to lower productivity in older stands if the soil remains wet for a week or more. The first Phytophthora resistant variety, Agate, was released in 1973 by Minnesota Agricultural Experiment Station and USDA. More recently Apollo and WL 318 have been released.

**FOLIAR DISEASE** — Common leafspot and blackstem are the most important foliar diseases throughout Minnesota. Losses from these diseases usually result in leaf losses which reduce both total yield and forage quality. Leaf diseases are minimal during dry weather, but rain, heavy dew or irrigation will increase their incidence and severity.

**INSECT RESISTANCE** — Losses caused by insects are usually less than those caused by diseases. Potato leafhopper can cause injury in July and August if harvest is delayed past 1/10 bloom. Potato leafhoppers are most serious in southern Minnesota.

Table 28. Average yields expressed as percentage of Vernal for all tests in Minnesota, 1959-1976

Variety	Yield (percent of Vernal)						
	Year after seeding					Average over years	
	1st	2nd	3rd	4th	5th-8th	1-2	3-8
<b>VERY WINTERHARDY</b>							
Norseman	97	93	89	—	—	95	89
Ladak	87	88	78	89	—	88	84
Teton	89	93	86	93	—	91	90
Travois	88	88	88	87	—	88	88
Ramsey	101	103	103	115	110	102	109
<b>WINTERHARDY</b>							
Dawson	100	104	104	100	98	102	101
Titan	101	101	104	103	107	101	105
123	101	104	101	102	110	103	104
WL 215	101	106	109	101	115	103	108
Agate	100	102	106	97	119	101	107
Vernal, tons hay/acre	4.7	4.5	4.4	4.4	4.1	4.6	4.3
Iroquois	109	104	104	110	106	106	107
Ladak 65	99	104	101	99	—	102	100
WL 202	101	101	104	106	100	101	103
521	99	105	100	96	—	102	98
Nuggett	104	103	95	93	—	104	94
Scout	101	100	100	99	90	101	96
SX-10	95	96	103	103	107	96	104
153	97	103	85	92	47	100	75
520	108	110	109	111	127	109	116
Valor	100	104	102	109	—	102	106
Weevlchek	107	107	109	103	98	107	103
Anchor	104	108	111	109	124	106	115
Gladiator	103	107	—	—	—	105	—
Polar I	97	98	100	99	—	98	100
Ranger	97	98	97	99	93	98	96
<b>MODERATELY WINTERHARDY</b>							
Pacer	100	109	—	—	—	105	—
Arc	102	101	98	—	—	102	98
Citation	101	105	111	—	—	103	111
Marathon	112	109	106	98	93	111	99
WL 216	109	108	108	102	109	109	106
WL 307	105	104	104	102	120	105	109
Apollo	98	100	—	—	—	99	—
Tempo	100	106	92	103	80	103	92
WL 306	105	110	103	105	111	108	106
A59	101	104	108	110	100	103	106
WL 310	—	—	—	—	—	—	—
530	101	102	90	104	—	102	97
Bonus	98	100	101	99	—	99	100
WL 305	97	100	108	—	—	99	108
WL 309	106	105	101	103	110	106	105
WL 311	105	108	104	—	—	107	104
Apex	101	109	102	105	62	105	90
Chimo	102	103	80	—	—	103	80
Honeoye	103	105	—	—	—	104	—
Saranac AR	106	107	—	—	—	107	—
WL 318	116	—	—	—	—	116	—
G777	101	101	97	—	—	101	97
Saranac	101	101	103	105	101	101	103
Thor	103	104	100	101	109	104	103
Vista	107	102	98	—	—	104	98
A-57	97	101	101	109	—	99	105
Glacier	101	104	85	85	25	103	65
Warrior	97	103	99	101	80	100	93
WL 219	—	—	—	—	—	—	—
A-24	109	101	—	—	—	105	—
Stride	94	102	99	85	25	98	69

Table 29. Winterhardiness index and disease and insect resistance of certified alfalfa varieties

Variety	Developer or owner <sup>1</sup>	Winter hardiness (index) <sup>2</sup>	RESISTANT PLANTS <sup>3</sup>				
			Bacterial wilt (percent)	Phytophthora root rot (percent)	Common leaf spot (percent)	Spring blackstem (percent)	Leafhopper yellowing (percent)
<b>VERY WINTERHARDY</b>							
				highest values best			
Norseman	Barzen of Minneapolis	7.9	34	5	34	27	36
Ladak	USDA (foreign introduction) <sup>a</sup>	7.5	9	2	22	23	43
Teton	S. Dakota Agr. Exp. Sta. <sup>a</sup>	7.4	17	9	51	30	61
Travois	S. Dakota Agr. Exp. Sta. <sup>k</sup>	7.4	42	1	42	44	72
Ramsey	Minnesota Agr. Exp. Sta. & USDA <sup>g</sup>	6.7	42	12	94	64	48
<b>WINTERHARDY</b>							
Dawson	Nebraska Agr. Exp. Sta. & USDA <sup>b</sup>	6.5	16	1	32	22	18
Titan	Rudy-Patrick Co. <sup>ci</sup>	6.4	68	3	31	60	47
123	DeKalb AgResearch Inc.	6.3	46	4	8	39	51
WL 215	Waterman-Loomis Co. <sup>de</sup>	6.3	40	5	23	38	23
Agate	Minnesota Agr. Exp. Sta. & USDA <sup>ceg</sup>	6.0	73	55	66	10	19
Vernal	Wisconsin Agr. Exp. Sta. & USDA <sup>b</sup>	6.5	47	3	23	41	29
Iroquois	Cornell University <sup>g</sup>	6.0	69	1	44	40	26
Ladak 65	Montana Agr. Exp. Sta. <sup>j</sup>	6.0	40	2	16	29	23
WL 202	Waterman-Loomis Co. <sup>de</sup>	6.0	39	2	7	39	29
521	Pioneer Hi-Bred International Inc.	6.0	21	1	—	—	—
Nuggett	PAG	5.9	52	<1	—	—	—
Scout	Farmers Forage Res. Coop. <sup>d</sup>	5.8	13	2	30	19	32
SX-10	Sexauer Co.	6.7	6	4	—	—	—
153	DeKalb AgResearch Inc.	5.7	2	10	7	19	27
520	Pioneer Hi-Bred International Inc.	5.6	45	1	25	42	42
Valor	Felco-Land O'Lakes <sup>f</sup>	5.5	40	<1	—	—	—
Weevlchek	Farmers Forage Res. Coop. <sup>d</sup>	5.5	64	2	47	38	74
Anchor	Rudy-Patrick Co. <sup>ci</sup>	5.4	40	4	58	18	13
Gladiator	Northrup, King & Co.	5.4	64	2	—	—	—
Polar I	Pride Seed Co.	5.4	55	9	—	—	—
Ranger	Nebraska Agr. Exp. Sta. & USDA <sup>b</sup>	5.4	16	2	11	7	16
<b>MODERATELY WINTERHARDY</b>							
Pacer	Felco-Land O'Lakes <sup>f</sup>	5.3	37	10	—	—	—
Arc	USDA <sup>b</sup>	5.2	8	4	—	—	—
Citation	North American Plant Breeders <sup>e</sup>	5.2	50	3	—	—	—
Marathon	Cargill	5.2	40	2	—	—	—
WL 216	Waterman-Loomis Co. <sup>de</sup>	5.2	28	2	11	27	44
WL 307	Waterman-Loomis Co. <sup>de</sup>	5.2	29	<1	—	—	—
Apollo	Rudy-Patrick Co. <sup>ci</sup>	5.1	40	43	—	—	—
Tempo	Farmers Forage Res. Coop. <sup>d</sup>	5.1	29	3	42	19	31
WL 306	Waterman-Loomis Co. <sup>de</sup>	5.1	25	1	16	40	28
A59	E.F. Mangelsdorf & Bros. Inc. <sup>h</sup>	5.0	18	5	21	42	18
WL 310	Waterman-Loomis Co. <sup>de</sup>	5.0	47	4	—	—	—
530	Pioneer Hi-Bred International Inc.	5.0	43	2	68	46	20
Bonus	Cal/West Seeds <sup>g</sup>	4.7	13	1	17	40	45
WL 305	Waterman-Loomis Co. <sup>de</sup>	4.7	25	6	13	47	36
WL 309	Waterman-Loomis Co. <sup>de</sup>	4.7	28	4	—	—	—
WL 311	Waterman-Loomis Co. <sup>de</sup>	4.7	40	3	—	—	—
Apex	Rudy-Patrick Co. <sup>c</sup>	4.6	<1	2	48	20	28
Chimo	Americana Seed Co.	4.6	22	1	—	—	—
Honeoye	Cornell University	4.6	18	<1	—	—	—
Saranac AR	Cornell University	4.6	33	8	—	—	—
WL 318	Waterman-Loomis Co. <sup>de</sup>	4.6	36	26	—	—	—
G777	Funk Seed Int.	4.5	28	5	—	—	—
Saranac	Cornell University <sup>ctfg</sup>	4.5	55	2	49	37	20
Thor	Northrup, King & Co.	4.5	78	1	—	—	—
Vista	Cal/West Seeds	4.5	38	<1	—	—	—
A-57	Embro Seed Co. Inc. <sup>h</sup>	4.4	14	8	—	—	—
Glacier	Northrup, King & Co.	4.4	<1	1	56	42	24
Warrior	Northrup, King & Co.	4.3	22	<1	55	26	16
WL 219	Waterman-Loomis Co. <sup>d</sup>	4.2	30	12	—	—	—
A-24	Embro Seed Co. Inc. <sup>h</sup>	4.2	5	2	64	28	25
Stride	Cal/West Seeds	3.0	2	1	58	17	31

<sup>1</sup> Seed supplies: a. not available or very limited, b. available from several sources, c. Associated Producers Inc. and Interstate Seed Co., d. Cenex Seed Co., e. Midland Cooperatives Inc., f. Land O'Lakes-Felco, g. Peterson Seed Co., h. Ramy Seed Co., i. Field Seed Farm, j. Barzen of Minneapolis, and k. The Sexauer Co. <sup>2</sup> Based on fall growth after cutting in 1st week of September: 1 = tallest, 9 = shortest. <sup>3</sup> Plants with little or no injury are classed as resistant.

## BIRDSFOOT TREFOIL

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

### RECOMMENDED VARIETIES

**Carroll** — Winterhardy, prostrate, persistent pasture type. Slightly earlier in maturity, better seedling vigor and larger seed than Empire. Released in 1970. Distributed by Peterson Seed Co. Seed sale regulated by U.S. Variety Protection Act.

**Empire** — Winterhardy, prostrate growth habit.

**Leo** — Winterhardy, higher yielding, less prostrate growth habit, and better seedling vigor than Empire. Released in 1963.

Table 30. Average yields expressed as percentage of Empire for all tests in Minnesota 1967-76

Variety	Developer	Yield (percent of Empire)			
		Year after seeding			Average
		1	2	3	
Empire	New York Agr. Exp. Sta. (tons hay/acre)	3.11	3.24	2.96	3.10
Leo	MacDonald College, Canada	119	109	112	113
Carroll	Iowa Agr. Exp. Sta.	116	112	106	111
Dawn	Missouri Agr. Exp. Sta.	107	108	107	107
Viking	New York Agr. Exp. Sta.	109	105	95	103
NK (N6-128)	Northrup, King & Co.	100	100	99	100
Maitland	Univ. of Guelph, Canada	116	101	77	98
Winnar	Soil Conservation Serv.	100	86	88	91
Tana	Montana Agr. Exp. Sta.	92	95	74	87
Mansfield	Vermont Agr. Exp. Sta.	27	51	99	59

## RED CLOVER

Red clover can be seeded in pure stands or with timothy for hay or silage. It is more easily established in pasture renovation than either alfalfa or trefoil. Historically, winterhardy varieties have not persisted beyond two crop years because of susceptibility to crown rot and other disease. Some of the new varieties may persist for 3 years. Red clover should not be seeded with alfalfa for hay because red clover seedlings are more aggressive than alfalfa seedlings and may prevent alfalfa from becoming established. Red clover is better adapted to acid soils than alfalfa, but where alfalfa can be grown successfully it will yield more than red clover.

### RECOMMENDED VARIETIES

**Arlington** — Very persistent, may be productive for 3 or 4 years.

**Kenstar** — Selected from Kenland for greater persistence under Kentucky conditions. Produces high first year yields.

**Lakeland** — Persistent with good forage yield in second crop year. Highly resistant to powdery mildew and resistant to northern anthracnose.

**Redman** — Persistent with good forage yields, similar to Lakeland in disease resistance.

### VARIETIES NOT ADEQUATELY LISTED

**Florex** — Selected from Dollard for greater persistence, resistance to northern anthracnose and powdery mildew, released in 1976 by Northrup, King & Co. for upper midwest.

**Florie** — Selected from Lakeland and Illinois #1 for greater persistence, resistance to both northern and southern anthracnose, and resistance to powdery mildew, released 1976 by Northrup, King & Co. for the midregion of the U.S.

**Prosper I** — Selected from Lakeland for persistence, and resistance to both northern anthracnose and powdery mildew, available from Pride Co., Inc.

**Redland** — Similar to Dollard in yield, but more persistent.

### OTHER VARIETIES

**Dollard** — Resistant to northern anthracnose, susceptible to powdery mildew, poor persistence.

**Kenland** and **Pennscott** — Very susceptible to northern anthracnose and virus, poor persistence.

**Clovage, Emerson, Orbit, Tensar, Truver** — Low yields, and poor persistence.

Table 31. Average yields of red clover expressed as percentage of Lakeland for all tests in Minnesota 1966-76

Variety	Developer or owner <sup>2</sup>	Yield (percent of Lakeland)				Stand 3 years after seeding <sup>1</sup> (percent)
		Year after seeding			Average 1st 2 years	
		1	2	3		
Lakeland	Wisconsin Agr. Exp. Sta. & USDA (tons hay/acre) <sup>D</sup>	3.65	3.49	1.76	3.57	55
Arlington	Wisconsin Agr. Exp. Sta. & USDA <sup>e,f,9</sup>	109	102	100	106	85
Kenstar	Kentucky Agr. Exp. Sta. & USDA <sup>a</sup>	108	95	88	102	63
Redman	Farmer's Forage Res. Coop. <sup>d</sup>	104	97	89	101	70
Redland	Illinois Agr. Exp. Sta. <sup>c</sup>	104	91	81	98	55
Dollard	MacDonald College, Canada	101	91	97	96	23
Kenland	Kentucky Agr. Exp. Sta. & USDA <sup>a</sup>	98	90	68	94	38
Clovage	Americana Seed Co.	96	90	78	93	38
Truver	Americana Seed Co.	101	80	65	91	28
Pennscott	Pennsylvania Agr. Exp. Sta.	94	71	0	83	28
Orbit	Mississippi Agr. Exp. Sta.	92	66	0	79	15
Tensar	Louisiana Agr. Exp. Sta.	56	62	0	59	23

<sup>1</sup> Rosemount. <sup>2</sup> Seed Supplies: a. not available or very limited, b. available from several sources, c. Associated Producers, Inc., Interstate Seed Co., and Field Seed Farm, d. Cenex, e. Midland Cooperatives, Inc., f. Land O'Lakes, and g. Pioneer Hi-Bred Int., Inc. — Peterson Forage Seed Div.

## BROMEGRASS

Bromegrass is generally known for hay in mixture with alfalfa or is used as pasture in mixture with other grasses and legumes. Present varieties can be classed as southern, intermediate, and northern types. Varieties of the southern type may not be higher yielding, but they are generally less susceptible to leaf diseases and earlier in maturity than northern types. Nearly all tested varieties are of the southern type and are satisfactory in winterhardiness. Some stand losses may occur when bromegrass is managed under a three-cut system.

The varieties have been evaluated in pure stands. Therefore, performance may be different when a variety is grown in mixtures with other grasses and legumes.

### RECOMMENDED VARIETIES

**Baylor** — Leafy, good seedling vigor.

**Blair** — Leafy, good seedling vigor.

**Fox** — Spreading, good seedling vigor, good tolerance to leaf diseases. Maturity similar to Lincoln. Released in 1968.

**Lincoln** — Spreading, good seedling vigor. Released in 1942.

**Sac** Leafy, moderately coarse, good tolerance to leaf diseases. Released in 1962.

**Saratoga** — Leafy, good aftermath production. Released in 1955.

Table 32. Dry matter yields of bromegrass varieties expressed as percentage of Fox at five locations, and average for 1966-1976

Variety	Developer or owner <sup>1</sup>	Crookston	Grand Rapids	Lamberton	Morris	Rosemount	Average
No. of trial years		2	4	1	2	5	
Fox ton/acre	Minnesota Agr. Exp. Sta. <sup>c</sup>	3.1	4.7	3.6	3.6	3.7	100
Barton	Land O'Lakes-Felco	—	—	—	102 <sup>2</sup>	116 <sup>3</sup>	111
Baylor	Rudy Patrick Co. <sup>b</sup>	106	93	104	100	106	101
Beacon	F.S. Services, Inc.	—	—	—	93 <sup>2</sup>	116 <sup>3</sup>	108
Blair	Midland Coop. Inc.	105	93	103	112	104	107
Bromage	Americana Seed Co.	—	—	—	96 <sup>2</sup>	111 <sup>3</sup>	106
Lincoln	Nebraska Agr. Exp. Sta.	97	89	98	98	97	95
Sac	Wisconsin Agr. Exp. Sta. <sup>b</sup>	102	92	99	95	108	100
Saratoga	New York Agr. Exp. Sta. <sup>a</sup>	103	102	105	105	100	102
Tempo	Agr. Canada, Ottawa <sup>a</sup>	—	—	—	—	90 <sup>2</sup>	90
LSD 5%		15	9	12	11	12	

<sup>1</sup> Seed supplies: a. not available or very limited, b. available from several sources, c. Cenex Seed Co.

<sup>2</sup> One year.

<sup>3</sup> Two years.

## ORCHARDGRASS

Orchardgrass is used with other grasses in mixtures with legumes because it establishes rapidly and recovers quickly after grazing or harvest. Its chief limitation is lack of winterhardiness, but in areas with reliable snow cover it may persist and remain productive. Orchardgrass should be grown in mixtures with adapted grasses having similar heading characteristics. Heading differences were greater among varieties grown at Rosemount than at Grand Rapids. Early heading varieties and common types tested are generally less satisfactory than those with medium to late heading in mixtures.

The varieties have been evaluated in pure stands. Therefore, performance may be different when a variety is grown in mixtures with other grasses and legumes.

Orchardgrass is affected more by leaf diseases than other forage grasses. Rust will particularly reduce quality and may affect yield and winterhardiness of pure orchardgrass stand. Diseases are less serious when orchardgrass is grazed or harvested frequently and when grown in mixtures with other grasses and legumes.



Agronomists L.J. Elling and D.K. Barnes and pathologist F.I. Frosheiser slice alfalfa roots in September to compare varieties for resistance to bacterial wilt.

Table 33. Characteristics of orchardgrass varieties with dry matter yields expressed as percentage of Hallmark at three locations, 1971-1976

Variety	Developer or owner <sup>1</sup>	Yield (percent of Hallmark)				Leaf rust reaction <sup>2</sup>			
		Grand Rapids	Morris	Rosemount	Average	Rosemount	Arlington, Wisconsin	Ames, Iowa	
No. of trial years		5	3	4	1	1	1	2	
<b>Early</b>									
Boone	Kentucky Agr. Exp. Sta.	85	—	96	—	91	4.8	3.5	2.5
Chinook	Agr. Canada, Lethridge <sup>a</sup>	83	81	85	—	83	4.5	—	4.0
<b>Medium</b>									
Able	Farmers Forage Res. Coop	89	—	93	92	91	—	—	3.0 <sup>3</sup>
Dart	Land O'Lakes-Felco	103	—	93	100	100	—	—	5.0
Dayton	Midland Coop. Inc.	93	—	94	111	95	—	3.9	2.5
Frode	Swedish Seed Assoc. <sup>d</sup>	94	89	92	—	92	—	—	2.0
Grassage	Americana Seed Co.	100	—	102	95	99	—	—	—
Hallmark ton/acre	Farmers Forage Res. Coop	3.4	3.0	4.3	1.7	100	4.8	4.1	3.0
Ina	Ontario Agr. Coll., Guelph <sup>a</sup>	90	—	89	—	89	3.3	—	2.0
Juno	Agr. Canada, Ottawa <sup>a</sup>	100	—	96	105	100	—	—	—
Napier	Rudy Patrick Co. <sup>b</sup>	98	—	94	99	95	3.8	4.0	2.5
Orbit	Northrup, King & Co. <sup>d</sup>	92	—	96	99	94	2.3	—	1.0
Ox-1	North American Plant Breeders <sup>a</sup>	101	—	—	98	99	—	—	—
Sterling	Iowa Agr. Exp. Sta. <sup>c</sup>	97	103	92	100	97	4.9	4.1	5.0
<b>Late</b>									
Comet	Northrup, King & Co. <sup>d</sup>	—	—	—	88	88	—	—	—
Kay	Agr. Canada, Ottawa <sup>a</sup>	91	—	87	91	89	—	—	—
Majestic	Maple Leaf Mills, Inc. <sup>a</sup>	—	—	90	96	93	—	—	2.6
Nordstern	Northrup, King & Co.	92	92	92	83	91	3.0	4.1	3.1
LSD 5%		9	9	9	12				

<sup>1</sup> Seed supplies: <sup>a</sup>not available or very limited, <sup>b</sup>available from several sources, <sup>c</sup>Land O'Lakes-Felco, <sup>d</sup>Northrup, King & Co.

<sup>2</sup> 1 = resistant. 5 = most susceptible. <sup>3</sup> One year. <sup>4</sup> Seed sale regulated by U.S. Variety.

## REED CANARYGRASS

Reed canarygrass is adapted throughout Minnesota for use as hay, pasture, or silage. It is one of the best grass species for use on poorly drained soil, in swampy areas, and in areas subject to spring flooding. The species is also well adapted to upland soils. The seedling vigor is not as good as that of other commonly used forage grasses. Reed canarygrass is less palatable than most species seeded for hay and pasture, but cattle will produce well on the grass if it is used before it becomes mature. Satisfactory pasture utilization occurs if the grass is grazed when it is between 6 and 24 inches tall. Harvesting hay between heading and early bloom is preferred, because the quality declines with advanced maturity. The varieties tested are winterhardy and persistent.

The varieties have been evaluated in pure stands. Therefore, performance may be different when a variety is grown in mixtures with other grasses and legumes.

### RECOMMENDED VARIETIES

**Frontier** — Slightly later in maturity and leafier than Ioreed. Licensed in 1959.

**Rise** — Stand establishment better and slightly later in maturity than Ioreed.

**Vantage** — Slightly earlier than Rise. Higher seed yield and less shattering than Rise in Minnesota trials. Released in 1972. Seed sale regulated by U.S. Variety Protection Act.

### VARIETIES NOT ADEQUATELY TESTED

**Castor** — Higher seed retention but similar to Frontier in maturity and forage yield. Licensed in 1972.

**Grove** — About 7-10 days later in maturity than Frontier, equal to Frontier in forage yield and slightly more palatable to cattle in Canadian trials. Licensed in 1970.

### OTHER VARIETIES

**Ioreed** — Moderately productive in first year's stand, mid-early in maturity. Appears similar to common types from older stands in Minnesota. Released in 1946.



Agronomist A.W. Hovin observes seed retention characteristics of reed canarygrass clones in a top-cross nursery. Short lengths of stem from single plants were planted to establish each row.

Table 34. Dry matter yields of reed canarygrass varieties expressed as percentage of Rise at four locations and average for 1972-76

Variety	Developer or owner <sup>1</sup>	Heading	Lamberton	Grand Rapids	Morris	Rosemount	Average
No. of trial years			2	3	2	3	
Rise ton/acre	Rudy Patrick Co. <sup>b</sup>	Medium	2.9	4.7	3.2	4.0	100
Castor	Agr. Canada, Beaverlodge <sup>a</sup>	Medium	91	—	96	—	93
Frontier	Agr. Canada, Ottawa <sup>c,d</sup>	Medium	96	94	101	95	96
Grove	Agr. Canada, Ottawa <sup>a</sup>	Late	—	87	82	90	87
Vantage	Iowa Agr. Exp. Sta. <sup>2</sup>	Medium	96	102	102	100	100
LSD 5%			10	6	5	5	

<sup>1</sup> Seed supplies: a. not available or very limited, b. available from several sources, c. Midland Coop. Inc., d. Pioneer Hi-Bred Int., Peterson Forage Seed Div. <sup>2</sup> Seed sale regulated by U.S. Variety Protection Act.

## TIMOTHY

Timothy is adapted throughout Minnesota for use in hay and pasture mixtures. When timothy is the major component in hay, its stage of maturity affects yield and quality. Harvesting at early bloom stage is preferred to later harvesting. Because timothy varieties differ in maturity, care should be taken in choosing varieties that will fit the management of the crop. Only very early varieties are adapted to a three-cut system with alfalfa. Varieties of medium and medium-late maturity should not be harvested more than twice during the growing season.

The varieties have been evaluated in pure stands. Therefore, performance may be different when a variety is grown in mixtures with other grasses and legumes.

### RECOMMENDED VARIETIES

**Clair** — Vigorous, and very early. Adapted to a three-cut system with alfalfa. Released in 1958.

**Climax** — Tall, fine-stemmed, leafy, medium-late maturity. Licensed in 1947.

**Itasca** — Less leafy than Climax, medium maturity. Well adapted throughout Minnesota.

**Lorain** — Medium-late maturity. Released in 1939.

**Timfor** — Medium-early, very leafy variety relatively free of leaf diseases. Named in 1971.

### VARIETIES NOT ADEQUATELY TESTED

**Basho** — Similar to Champ in maturity and forage yield in Canadian trials.

**Bounty** — Coarser and nearly one week later than Climax in Canadian trials. Licensed in 1966.

**Champlain** — Medium-late, three-clone synthetic variety released in 1974 by New York Agricultural Experiment Station.

**Champ** — Leafy with good aftermath in Canadian trials. Five to seven days earlier in maturity than Climax. Licensed in 1967.

**Milton** — Medium-late variety similar to Itasca in maturity and appears to be resistant to rust in Canada.

**Pronto** — Similar in maturity to Itasca.

**Toro** — Medium-early Italian variety with wide range of adaptation.

### OTHER VARIETIES

**Drummond** — Relatively tolerant to rust, medium-late maturity.

**Verdant** — Leafy, relatively disease free, but low yielding, late maturity. Released in 1968.

Table 35. Dry matter yields of timothy varieties expressed as percentage of Itasca at three locations and average for 1965-76

Variety	Developer or owner <sup>1</sup>	Grand Rapids	Morris	Rosemount	Average		
No. of trial years		6	1	3	4	1	
<u>Very early</u>							
Clair	Kentucky Agr. Exp. Sta.	97	90	101	106	107	100
<u>Medium-early</u>							
Basho	Agr. Canada, Ottawa <sup>a</sup>	—	87	—	97 <sup>2</sup>	99	94
Champlain	New York Agr. Exp. Sta. <sup>a</sup>	—	75	—	—	79	77
Champ	Agr. Canada, Ottawa <sup>a</sup>	96	—	—	—	101	95
Timfor	Northrup, King & Co.	—	92	—	102	103	100
Toro	Institute le Colture Foraggere, Milano, Italy <sup>a</sup>	—	91	—	—	96	94
<u>Medium</u>							
Bounty	Agr. Canada, Ottawa <sup>a</sup>	—	—	—	—	86	86
Climax	Agr. Canada, Ottawa <sup>b</sup>	95	85	100	99	106	97
Itasca ton/acre	Minnesota Agr. Exp. Sta. <sup>b</sup>	4.0	3.6	3.7	3.2	1.8	100
Milton	Macdonald Coll. Quebec <sup>a</sup>	—	93	—	—	92	92
Pronto	Pride Seed Co.	90 <sup>2</sup>	96	—	97	103	97
<u>Medium-late</u>							
Lorain	Ohio Agr. Exp. Sta. & USDA <sup>a</sup>	90 <sup>2</sup>	89	91	99	102	93
Verdant	Wisconsin Agr. Exp. Sta. & USDA	94	—	87	98	—	92
LSD 5%		6	10	10	8	13	

<sup>1</sup> Seed supplies: a. not available or very limited, b. available from several sources.

<sup>2</sup> One year.

# NOTES

**RATE AND DATE OF SOWING**

Rates are based on average seedbed and on use of good quality seed of high germination. Use high rate for large-seeded and low rate for small-seeded recommended varieties. Increase rate for seed of low germination.

Crop	Bushel weight* (pounds)	Rate/acre (pounds)	Date
Barley . . . . .	48	72-96	Early spring
Corn . . . . .	56	10-20	Late April or early May
Flax . . . . .	56	42-56	April 15 to May 15
Forage Grass (perennial) If mixed with legumes, sow at time indicated for the legume.			
Bromegrass in mixtures . . . . .	14	5-8	Early spring or late summer
Orchardgrass in mixtures . . . . .	14	2-6	Early spring or late summer
Reed canarygrass . . . . .	44-48	4-8	Early spring or late summer
Alone . . . . .		6-8	
In mixtures . . . . .		4-6	
Timothy in mixtures . . . . .	45	2-6	Early spring or late summer
Forage Legumes (biennial or perennial)			
Alfalfa . . . . .	60	5-12	Early spring to August 10
Alone . . . . .		10-12	
With grasses . . . . .		5-8	
Birdsfoot trefoil (with grasses) . . . . .	60	5-6	Early spring
Clover . . . . .	60	½-8	Early spring
Alsike (in mixture) . . . . .		2	
Ladino (in mixture) . . . . .		½-1	
Red (in mixture) . . . . .		4-8	
Sweet Clover . . . . .	60	2-12	Early spring
Alone . . . . .		10-12	
In mixture . . . . .		2-4	
Oats . . . . .	32	64-80	Early spring
Rye . . . . .	56	56-70	September
Sorghum . . . . .	50 (sweet), 56 (grain)	5-15	May 20 to June 5 for grain
18- to 40-inch rows . . . . .		5-10	
6- to 14-inch rows . . . . .		7-15	
Sudangrass . . . . .	40	10-30	May 20 to June 10
18- to 40-inch rows . . . . .		10-20	
6- to 14-inch rows . . . . .		25-30	
With 1½ bushels of soybeans . . . . .		10	
Soybeans . . . . .	60	50-100	
6- to 7-inch rows . . . . .		100 (4 seeds/ft.)	
20-inch rows . . . . .		65 (7 seeds/ft.)	May 5-25
30-inch rows . . . . .		55 (9 seeds/ft.)	
40-inch rows . . . . .		50 (11 seeds/ft.)	
Wheat . . . . .	60	75-90	
Hard Red Spring . . . . .		75-90	Early spring
Durum . . . . .		90	Early spring
Winter . . . . .		75-90	Aug. 20 to Sept. 20
Other Crops			
Annual canarygrass . . . . .	50	40	Early spring
Buckwheat . . . . .	48-50	40-48	June 15 to July 15
Field beans . . . . .	60	35-100	May 20 to June 15
Great northern . . . . .		55-100	
Kidney . . . . .		75-100	
Navy . . . . .		40-45	
Pinto . . . . .		60-80	
Small white . . . . .		35-40	
Field peas . . . . .	60	120-225	Early spring
With 1½ to 2 bushels of oats . . . . .		45-90	
Fababeans — medium size . . . . .	60	180	Early spring
With 2 bushels of oats . . . . .		60	
Millet . . . . .	48-56	20-40	June 15 to July 15
Mustard and oilseed rape . . . . .	50-58	10	May 1 to June 15
Rape for forage . . . . .	50	4-6	Early spring with oats
Sunflowers . . . . .	24	3-8	May 1-25

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