

MISCELLANEOUS REPORT 24  
REVISED DECEMBER 1971

AGRICULTURAL EXPERIMENT STATION  
UNIVERSITY OF MINNESOTA



*Varietal  
Trials*  
OF FARM CROPS

# 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 Elk River, 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.

Yields of birdsfoot trefoil, red clover, bromegrass, timothy, and reed canarygrass reported in the following sections are given in 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 (or multiply by 1.2). To convert to haylage yield at 55 percent moisture (45 percent dry matter), divide by 0.45 (or multiply by 2.2).

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 for 1972 Planting. This annual publication can be obtained without charge from the Minnesota Crop Improvement Association, St. Paul, Minnesota 55101, or from county extension agents' offices.

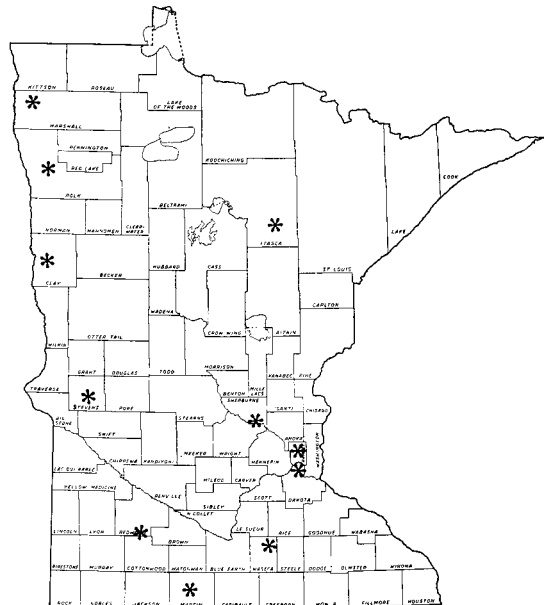
Authors of the following sections are: barley, D. C. Rasmusson; oats, D. D. Stuthman; spring and winter wheat, R. E. Heiner; rye, millet, grain sorghum, peas, dry beans, and sunflowers, R. G. Robinson; flax, V. E. Comstock and J. H. Ford; soybeans, J. W. Lambert; alfalfa, D. K. Barnes; and birdsfoot trefoil, red clover, bromegrass, reed canarygrass, and timothy, A. Hovin. Extension agronomists H. J. Otto and E. A. Oelke also participated in preparing this publication.

Much of the information on disease reaction of the varieties was obtained from staff members of the Department of Plant Pathology.

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

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\* 1971 varietal trials were conducted at these locations.

# BARLEY

## RECOMMENDED VARIETIES

**Conquest**—Six-rowed, smooth-awned, long rachilla hairs, blue aleurone. High yield, good lodging resistance. Highly resistant to loose smut. Classified as a malting variety by Malting Barley Improvement Association (MBIA). Developed by Canada Department of Agriculture at Brandon, Manitoba, from crosses involving Vantage, Jet, Vantmore, Br. 4635-4456, U. M. 570, and Parkland. Released in 1965.

**Dickson**—Six-rowed, rough-awned, short rachilla hairs, colorless aleurone. Yields more than Larker when leaf diseases are present. Kernel plumpness inferior to Larker. Has resistance to prevalent leaf spotting diseases. Classified as a malting variety by MBIA. Developed by North Dakota Agricultural Experiment Station from crosses involving Traill, Kindred, and CI 7117-77. Released in 1964.

**Larker**—Six-rowed, semi-smooth awned, long rachilla hairs, colorless aleurone. Yields less than Dickson. Excellent kernel plumpness. Susceptible to loose smut and leaf spotting diseases. Classified as a malting variety by MBIA. Developed by North Dakota Agricultural Experiment Station from a cross of Traill and a selection from U. M. 570. Released in 1961.

## VARIETIES NOT ADEQUATELY TESTED

**Bonanza**—Six-rowed, semi-smooth awned, long rachilla hairs, blue aleurone. Similar to Conquest in yield and lodging

resistance, but matures about 2 days later. Resistant to stem rust and loose smut. Malting quality status in the U.S. undetermined. Developed by Canada Department of Agriculture at Brandon, Manitoba, from a cross involving Vantage, Jet, Vantmore, Parkland, and Conquest. Released in 1970.

**Burk**—Six-rowed, smooth-awned, long rachilla hairs, colorless aleurone variety. Lower than Dickson in yield in regional trials. Similar to Larker in maturity, height, lodging reaction, and plump kernels. Ranges between Larker and Dickson in resistance to leaf spotting diseases. Not classified as a malting variety by MBIA. Developed by Wisconsin Agricultural Experiment Station from a cross of Wise X691-1 and Swan. Released in 1971.

**Nordic**—Six-rowed, rough-awned, short rachilla hairs, colorless aleurone variety. Yields similar to Dickson. Taller than Larker, but similar in lodging resistance. Superior to Larker in resistance to leaf spotting diseases and to Dickson in resistance to Septoria leaf blotch. Malting quality status undetermined. Developed by North Dakota Agricultural Experiment Station from crosses of Dickson, CI 4738, Traill, and U.M. 570. Released in 1971.

**Prilar**—Six-rowed, smooth-awned, long rachilla hairs, colorless aleurone variety. Similar to Larker in yield, height, maturity, lodging reaction, and disease resistance. Malting quality status undetermined. Developed at South Dakota Agricultural Experiment Station from a cross of Primus and Larker. Released in 1971.

Table 1. Yields of barley varieties in bushels per acre

	Morris	Crookston	St. Paul	Rosemount	Lamberton	Stephen	Average
Colorless aleurone varieties, 1966-71							
No. of trials:	11	8	5	4	3	3	
Dickson	61	63	67	61	70	71	65
Larker	59	62	59	62	71	60	62
Primus II	60	64	76	62	75	57	65
LSD 5%	3	4	6	5	7	8	2
Blue aleurone varieties, 1968-71							
No. of trials:	5	3	2	1	1	1	
Conquest	65	64	75	37	68	64	64
Bonanza	67	62	74	38	57	86	65
LSD 5%	5	6	10	7	14	16	3

Table 2. Characteristics of barley varieties, 1968-71

Variety	Yields, bushels/acre		Heading (June)	Height (inches)	Lodging (percent)	Plump kernels (percent)	Reactions to disease‡		
	14 trials*	37 trials†					Leaf spotting	Loose smut	Stem rust
Dickson	75	73	23	32	28	35	R	S	R
Larker	69	67	22	33	32	64	S	S	R
Primus II	67	68	17	33	28	72	S	S	R
Burk	68	68	22	34	27	66	MR	S	R
Nordic	75	74	22	34	33	55	R	S	R
Prilar	70	69	21	34	29	71	S	S	R
Bonanza	72	71	23	35	28	48	S	R	R
Conquest	72	71	22	36	23	51	S	R	R

\* Trials in Red River Valley. † Trials in North Central Region.

‡ R = resistant, MR = moderately resistant, S = susceptible.

## OTHER VARIETIES

**Paragon**—Six-rowed, smooth-awned, long rachilla hairs, blue aleurone. Yields less and matures later than Conquest. Resistant to stem rust and loose smut. Malting quality status in the U.S. undetermined. Developed by Canada Department of Agriculture at Brandon, Manitoba, from a cross of Br. 7212 and Parkland. Released in 1968.

**Primus II**—Six-rowed, smooth-awned, long rachilla hairs, colorless aleurone. High yield. Early. Good kernel plumpness. Not classified as a malting variety by MBIA. Developed by

## RECOMMENDED VARIETIES

**Diana**—Early, medium yield, short, good lodging resistance, high bushel weight, medium groat percentage, yellow seed. Susceptible to crown rust. Selected at the Purdue Agricultural Experiment Station from a cross involving several lines. Released in 1970.

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

**Garland**—Medium maturity and yield, short, fair lodging resistance, high bushel weight and groat percentage, yellow seed. Susceptible to crown rust. Selected at the Wisconsin Agricultural Experiment Station from crosses involving Clintland, Garry, Hawkeye, and Victoria. Released in 1962.

**Lodi**—Late, high yield, tall, good lodging resistance, medium bushel weight and groat percentage, white seed. Some resistance to crown rust. Selected at the Wisconsin Agricultural Experiment Station from crosses involving Richland, Bond, Hawkeye, Garry, and Victoria. Released in 1963.

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

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

**Sioux**—Late, high yield, medium height, poor lodging resistance, low bushel weight and groat percentage, white seed. Susceptible to crown rust. Selected in Canada from the cross Garry x Rex. Released in 1966.

## VARIETIES NOT ADEQUATELY TESTED

**Grundy**—Early, medium yield, short, poor lodging resistance, high bushel weight and groat percentage, yellow seed. Susceptible to crown rust. Selected at the Iowa Agricultural Experiment Station from the cross Clintland x Garry-5. Released in 1971.

## OTHER VARIETIES

**Cayuse**—Late, high yield, short, fair lodging resistance, low bushel weight and groat percentage, white seed. Susceptible to crown rust. Selected at the New York Agricultural Experiment Station but released from the Washington Agricultural Experiment Station from the cross Craig x Alamo. Released in 1966.

**Harmon**—Late, medium yield, tall, poor lodging resistance, low bushel weight and groat percentage, white seed. Susceptible to crown rust. Selected in Canada from crosses involving several lines. Released in 1965.

**Holden**—Medium maturity, high yield, medium height, good lodging resistance, high bushel weight and medium

South Dakota Agricultural Experiment Station from crosses of Brandon 3902, Liberty, and Swan. Released in 1966.

**Trail**—Six-rowed, rough-awned, short rachilla hairs, colorless aleurone. Low percentage of plump kernels. A malting variety. Developed at North Dakota Agricultural Experiment Station from a cross of Kindred and Titan. Released in 1956.

**Trophy**—Six-rowed, rough-awned, long rachilla hairs, colorless aleurone. Medium yield. Good kernel plumpness. A malting variety. Developed at North Dakota Agricultural Experiment Station from a cross of Trail and a selection from U. M. 570. Released in 1961.

## OATS

groat percentage, yellow seed. Susceptible to crown rust. Selected at the Wisconsin Agricultural Experiment Station from the same crosses as Garland. Released in 1966.

**Iowa Early Multiline Blend (E68, E69, E70)**—Early, medium yield, short, good lodging resistance, high bushel weight and groat percentage, yellow seed. Heterogeneous crown rust reaction, susceptible to smut. The recurrent parent is CI 7970. Developed at the Iowa Agricultural Experiment Station and originally released in 1968.

**Iowa Midseason Multiline Blend (M68, M69, M70)**—Medium maturity, high yield, medium height, fair lodging resistance, high bushel weight and groat percentage, yellow seed. Heterogeneous reaction to crown rust, susceptible to smut. The recurrent parent is CI 7555, a Clintland type. Developed at the Iowa Agricultural Experiment Station and originally released in 1968.



Agronomist V. B. Cardwell and pathologist P. G. Rothman examine a plot of the newly recommended Froker oats.

**Jaycee**—Early, medium yield, short, poor lodging resistance, high bushel weight and medium groat percentage, white seed. Susceptible to crown rust. Selected at the Illinois Agricultural Experiment Station from crosses involving Clintland, Garry, Hawkeye, Victoria, and Putnam. Released in 1966.

**Kelsey**—Late, high yield, medium height, fair lodging resistance, low bushel weight and groat percentage, white seed. Some resistance to crown rust. Selected in Canada from crosses involving several lines. Released in 1966.

**Kota**—Medium-late maturity, high yield, medium height, poor lodging resistance, high bushel weight and groat percentage, white seed. Some resistance to crown rust. Selected at the South Dakota Agricultural Experiment Station from crosses involving Clinton, Landhafer, RL 2120, and Garry. Released in 1968.

**Minhafer**—Early, medium yield and height, fair lodging resistance, high bushel weight, medium groat percentage, yellow seed. Some resistance to crown rust, and only variety with some resistance to 6AF stem rust. Selected at the Minnesota Agricultural Experiment Station from crosses involving

several lines. Released in 1957.

**Orbit**—Medium-late maturity, high yield, short, fair lodging resistance, low bushel weight and groat percentage, white seed. Some resistance to crown rust. Selected at the New York Agricultural Experiment Station from crosses involving Alamo, Garry (Sel. 5), Goodwin, Victoria, and Rainbow. Released in 1966.

**Rodney**—Late, medium yield, tall, poor lodging resist-

ance, medium bushel weight, white seed. Some resistance to crown rust. Selected in Canada from crosses involving Victoria, Hajira, Banner, Victory, and Roxton. Released in 1952.

**Tippecanoe**—Early, low yield, short, fair lodging resistance, medium bushel weight and groat percentage, yellow seed. Susceptible to crown rust. Selected at the Purdue Agricultural Experiment Station from the cross Clintland 60 x Mo. 0-205. Released in 1964.

Table 3. Yields of oat varieties in bushels per acre, 1969-71

Variety	Rosemount	Waseca	Lamberton*	Morris	Crookston	Grand Rapids	State average	Hawley†
E70‡	68	54	92	88	82	54	73	54
Minhafer	70	63	91	83	84	52	74	65
Diana	73	54	94	90	81	70	77	75
Garland	64	53	83	85	85	70	73	71
M70	79	60	92	96	84	77	81	72
Otter	71	60	92	95	95	75	82	97
Portal	77	62	89	90	91	67	79	101
Sioux	79	62	94	105	106	94	90	98
Froker	79	71	92	93	94	72	83	
Lodi	68	58	84	97	101	72	80	89
Cayuse§	68	67	102	95	104	100	89	110
LSD 5%	6	6	8	8	9	11	3	17

\* 1969 and 1971 only.

† 1971 only and not included in state average.

‡ Not harvested at Morris and Crookston in 1971.

§ 1970 and 1971 only.

Table 4. Characteristics of oat varieties, 1969-71

Variety	Heading (date)	Height (inches)	Lodging (score)*	Bushel weight (pounds)	Groat (percent)†	Reaction to disease§				
						Stem rust‡	Crown rust	Smut	Red leaf virus	Septoria leaf spot
E70	6-22	35	2.1	37	75	S	R,S	S	S	MR
Minhafer	6-24	38	2.1	35	72	MS	MS	R	MS	MR
Diana	6-25	35	1.9	35	71	S	S	MS	MS	MS
Garland	6-26	35	2.6	34	73	S	S	R	MS	R
M70	6-26	37	2.3	35	74	S	R,S	S	MS	MR
Otter	6-27	35	1.9	33	73	S	S-MS	R	MR	S
Portal	6-28	38	2.4	35	73	S	MS	R	MS	MS
Sioux	6-30	38	3.1	33	71	S	S	R	MS	MS
Froker	7-1	38	2.2	35	72	S	MR	MR	S	S
Lodi	7-1	43	1.9	33	70	S	MS-S	MR	S	MR
Cayuse	7-2	35	3.0	30	62	S	S			MR

\* 1 erect, 5 flat.

† Groat percentages may be more important than bushel weight; however, the two characters are usually positively correlated.

‡ Reaction to races 6AF and 6AH. Race 6AF has been the most prevalent race for the past several years.

§ R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, and R,S = resistant and susceptible plants in the variety.

## WINTER RYE

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

### RECOMMENDED VARIETIES

**Cougar**—High yield, winterhardy, late, medium height. Very good lodging resistance. Small seed of green and tan color, and medium bushel weight. Originated by the University of Manitoba from an open-pollinated selection in a composite cross of European and Canadian varieties. Named and released in Canada in the fall of 1967.

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

### VARIETIES NOT ADEQUATELY TESTED

**Coloma**—Medium to high yield, winterhardy, medium maturity, tall. Very good lodging resistance. Medium size

seed of tan color ("white") and low bushel weight. Originated by the Wisconsin Agricultural Experiment Station from five selfed plants from crosses of inbred lines of Adams. Named and released in 1970.

**Kodiak**—High yield, winterhardy, late, and tall in Canadian trials. Large seed of predominantly light tan color and low bushel weight. Originated by the University of Alberta as a shorter strawed selection from Sangaste. Named and licensed in Canada in 1971.

**Lovaszpatonia**—High yield. More testing needed to determine winterhardiness. Very early and tall. Large seed of predominantly green color and medium bushel weight. Originated in a Balkan country.

**Zelder**—High yield. More testing needed to determine winterhardiness. Late and tall. Large seed of predominantly green color and high bushel weight. Originated by Kweekbedrijf C.I.V. Ottersum, Holland.

### OTHER VARIETIES

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

**Pearl**—High yield, fair winterhardiness, late, tall. Medium size seed of brown and green color and medium bushel weight. Obtained from Canada Department of Agriculture



Agronomist R. G. Robinson between plots of Von Lochow rye in a variety trial sown at different dates to determine if varieties differ in optimum planting date.

Experimental Farm, Swift Current, Saskatchewan, under the name Pearl, and thought to originate from seed imported from Denmark about 1952. Released by the Minnesota Agricultural Experiment Station in 1966.

**Wheeler**—Low yield, poor winterhardiness, late, tall. Very large seed of predominantly green color and low bushel weight. Tetraploid. For maximum grain yield, must be grown isolated from other rye varieties; pollen from diploid rye will reduce the seed set of Wheeler and vice versa. Originated by the Michigan Agricultural Experiment Station from a cross of 4n Gator x 4n allotetraploid. Named and released in 1970.

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

Variety	Rosemount 1967-71	Waseca 1968-70	Lamberton 1969-70	Morris 1968-71	Grand Rapids 1968-71	Average of 5 locations
Cougar	53	58	66	67	64	62
Von Lochow	59	63	69	62	64	63
Frontier	49	58	60	65	60	58
Pearl	57	55	64	66	64	61
LSD 5%	2	7	5	5	4	2
Coloma*	53	—	—	63	63	—
Lovaszpatonia†	56	—	—	—	—	—
Zelder*	56	—	—	—	74	—
Wheeler*	49	—	—	0	10	—

\* 1971.

† 1970-71.

Table 6. Characteristics of winter rye varieties, 1967-71

Variety	Winterkill (percent)	Heading (date)	Mature (July)	Lodging (score*)	Height (inches)	Weight/100 seeds (grams)	Bushel weight (pounds)
Cougar	8	6-3	26	2.4	49	2.4	54.8
Von Lochow	19	6-4	27	2.3	51	2.9	56.0
Frontier	7	6-1	24	5.1	54	2.5	56.2
Pearl	7	6-3	26	4.1	53	2.6	55.1
Coloma	4	6-2	25	1.8	56	2.6	53.9
Lovaszpatonia	15	5-29	24	3.5	60	3.2	55.1
Zelder	10	6-4	29	3.3	55	3.2	56.2
Wheeler	55	6-5	31	1.2	52	3.8	53.9

\* 1 erect, 9 flat.

# HARD RED SPRING WHEAT

## RECOMMENDED VARIETIES

*Tall varieties*—The following varieties have performed well and have good quality.

**Chris**—Awnless, medium height and maturity. Fair resistance to lodging. Resistant to leaf and stem rust. High yield and medium bushel weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Frontana, Kenya 58, Newthatch, and Thatcher. Released by the Minnesota Agricultural Experiment Station in 1965.

**Polk**—Awned, bronze chaff, medium height and maturity. Medium resistance to lodging. Resistant to stem and leaf rust. High yield and bushel weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Thatcher, Supreza, Frontana, Kenya 58, and Newthatch. Released by the Minnesota Agricultural Experiment Station in 1968.

*Semidwarf varieties*—The following three varieties generally are higher yielding than the tall ones, but are lower in protein and bake absorption.

**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 medium bushel 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 the Minnesota Agricultural Experiment Station in 1970.

**Fletcher**—Awned, midseason to late semidwarf with high lodging resistance. Resistant to stem and leaf rust. Tolerant of Septoria, bunt, and ergot. High yield and medium bushel 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 the Minnesota Agricultural Experiment Station in 1970.

**World Seeds 1809**—Awnless, early semidwarf with high lodging resistance. Resistant to stem and leaf rust. High yield and medium bushel weight. Milling characteristics are satisfactory. Protein content and bake absorption are lower than Chris, but better than Era. Parentage not disclosed. Released by World Seeds Incorporated in 1970.

## VARIETIES NOT ADEQUATELY TESTED

**Bounty 208**—Awned, early semidwarf with high lodging resistance. Resistant to stem and leaf rust. High yield and medium bushel weight. High incidence of necrotic lesions on leaves. Limited quality data indicate low in protein and bake absorption. Parentage not disclosed. Released by Cargill, Inc., in 1970.

**Lark**—Awned, early semidwarf with high lodging resistance. Resistant to stem and leaf rust. Moderately susceptible to black chaff. Limited data indicate high yield and medium bushel weight. One year's quality data show lower protein and bake absorption than Chris. Parentage not disclosed. Released by World Seeds Incorporated in 1971.

**Nordak**—Awned, medium height and maturity. Insufficient data on yield, quality, and disease resistance. Selected as a single plant in a field of durum wheat by A. H. Berg, Barney, North Dakota. Released to farmers in 1971.

## OTHER VARIETIES

**Bonanza**—Awned, early maturing semidwarf with high lodging resistance. Resistant to stem and leaf rust. High in-



Agronomist R. E. Heiner between plots of the high yielding Minnesota semidwarf wheat varieties, Fletcher and Era.

cidence of necrotic lesions on leaves. Milling characteristics are satisfactory. Protein content and bake absorption are low. Parentage not disclosed. Released by DeKalb Agricultural Research in 1970.

**Crim**—Awned, medium height and maturity. Fair lodging resistance. Susceptible to loose smut and leaf rust but resistant to stem rust. Medium yield and bushel weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Klein, Titan, Thatcher, Kenya 58, and Newthatch. Released by the Minnesota Agricultural Experiment Station in 1963.

**Inia 66**—Awned, early semidwarf with high lodging resistance. Resistant to stem rust but susceptible to leaf rust. Susceptible to shattering. High yield and medium bushel weight. Protein content and bake absorption are low. Selected from crosses of Lerma Rojo and Sonora 64. Released in Mexico in 1966.

**Justin**—Awnless, midseason, and medium lodging resistance. Susceptible to leaf rust but resistant to stem rust. Fair yield and medium bushel weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Conley, Thatcher, Kenya Farmer, Mida, and Lee. Released by the North Dakota Agricultural Experiment Station in 1962.

**Manitou**—Awnless, medium height and maturity. Fair resistance to lodging. Resistant to stem rust but susceptible to leaf rust. High yield and medium bushel weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Thatcher, Frontana, Canthatch, and P.I. 170925. Released by the Canada Department of Agriculture at Winnipeg in 1965.

**Nee-pawa**—Awnless, early, and medium height. Medium resistance to lodging. Resistant to stem rust but susceptible to leaf rust. High yield and medium bushel weight. Milling and baking characteristics are unsatisfactory. Selected from crosses involving Thatcher, Frontana, and Kenya Farmer. Released by the Canada Department of Agriculture at Winnipeg in 1969.

**Red River 68**—Awned, early, semidwarf with high lodging resistance. Resistant to stem and leaf rust. High yield and bushel weight. Milling and baking characteristics are unsatisfactory. Parentage not disclosed. Released by World Seeds Incorporated in 1967.

**Selkirk**—Awnless, medium height and maturity. Medium lodging resistance. Susceptible to leaf rust but resistant to stem rust. Medium yield and bushel weight. Milling and baking characteristics are satisfactory. Selected from crosses involving McMurachy, Exchange, and Redman. Released by the Canada Department of Agriculture at Winnipeg, Manitoba, in 1953.

**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 bushel weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Lee, Mida, K338AA, and Justin. Released by the North Dakota Agricultural Experiment Station in 1969.

**World Seeds 1812**—Awned, early semidwarf with high lodging resistance. Resistant to stem and leaf rust. High yield and bushel weight. Protein content and bake absorption are low. Dough handling properties are undesirable. Parentage not disclosed. Released by World Seeds Incorporated in 1969.

Table 7. Characteristics of spring wheat varieties, 1969-71

Class and variety	Heading (date)	Plant height (inches)	Lodging (score)*	Leaf rust reaction†	Stem rust reaction†	Bushel weight (pounds)	Yield, bushels/acre				Milling, baking quality	
							St. Paul	Morris	Crooks-ton	Stephen‡		Average§
<b>Hard Red Spring</b>												
Chris	6-26	38	4.0	R	R	62.1	32	38	44	44	38	high
Polk	6-26	38	3.5	R	R	62.4	33	35	44	41	37	v. high
Era	6-27	30	2.2	R	R	62.1	39	47	55	53	48	low-med
Fletcher	6-28	30	2.0	MR	R	62.0	31	42	47	45	40	medium
World Seeds 1809	6-22	29	2.0	R	R	61.2	43	44	49		45	medium
World Seeds 1812	6-25	28	2.0	R	R	62.5	34	38	43	42	38	low
Waldron	6-24	36	2.0	R	R	60.9	35	44	44		41	high
Neepawa	6-25	37	3.5	S	R	61.9	35	38	46		40	low
Inia 66	6-22	29	2.5	S	R	61.8	37	34	38		36	med-low
Justin	6-26	37	3.3	S	R	60.8	31	32	34		32	v. high
Red River 68	6-22	30	2.2	R	R	62.5	39	40	46	48	42	low
LSD 5%							4	4	5		2	
Manitou‡	6-26	37	3.8	S	R	60.2	30	35	43	40	36	high-med
Bonanza‡	6-23	28	2.5	R	R	60.0	26	38	39		34	med-low
Bounty 208¶	6-24	28	2.5	R	R	60.4	35	40	46		40	med-low
Lark¶	6-24	28	2.5	R	R	59.3	32	30	41		35	medium‡
<b>Durum</b>												
Mindum	7-4	45	4.0	R	S	62.8	28	32	36		32	
Wells	7-1	39	3.0	R	R	62.9	32	37	49		39	
Leeds	7-1	38	2.5	R	R	63.6	28	35	44		36	
Hercules	6-28	37	2.0	S	R	62.0	32	39	42		38	
Rolette	6-28	37	2.2	MS-S	R	63.4	33	39	51		41	
LSD 5%							4	4	5		3	
Lakota¶	6-29	39	3.5	MR	R	59.8	33	42	25		33	

\* 1 erect, 9 flat

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

‡ 1970-71

§ Average of St. Paul, Morris and Crookston.

¶ 1971

## DURUM WHEAT

### RECOMMENDED VARIETIES

**Leeds**—Awned, early, medium height and lodging resistance. Resistant to leaf and stem rust and loose smut. Very high bushel weight with large kernels. Quality is satisfactory for semolina products. Selected from crosses involving Brandon 180 and Wells. Released by the North Dakota Agricultural Experiment Station in 1966.

**Wells**—Awned, early, medium height and lodging resistance. Resistant to stem and leaf rust, bunt, and loose smut.

High yield and medium bushel weight. Quality is satisfactory for semolina products. Selected from crosses involving Sentry, Ld. 379, and Ld. 357. Released by the North Dakota Agricultural Experiment Station in 1960.

### VARIETIES NOT ADEQUATELY TESTED

**Rolette**—Awned, early, medium height, and high lodging resistance. Resistant to stem rust, moderately susceptible to



leaf rust. High yield and high bushel weight. Quality is satisfactory for semolina products. Selected from crosses involving Ld. 393, Langdon, Ld. 398, Ld. 357, and St. 464. Released by the North Dakota Agricultural Experiment Station in 1971.

#### OTHER VARIETIES

**Hercules**—Awned, early, medium height, and high lodging resistance. Resistant to stem rust, susceptible to leaf rust and Septoria. High yielding with medium bushel weight. Quality is satisfactory for semolina products. Released by the Canada Department of Agriculture at Winnipeg in 1969.

## WINTER WHEAT

#### RECOMMENDED VARIETIES

**Minter**—Awned, tall, winterhardy, and medium lodging resistance. Susceptible to leaf rust and to some prevalent races of stem rust. High yield and medium bushel weight. Quality characteristics are satisfactory. Selected from a back-cross of Hope and Minturki. Released by the Minnesota Agricultural Experiment Station in 1949.

**Winoka**—Awned; winterhardy; medium height, maturity, and lodging resistance. Susceptible to leaf and moderately resistant to stem rust. Severe leaf necrosis in certain years. Milling and baking characteristics are satisfactory. Re-selection from Winalta by the South Dakota Agricultural Experiment Station in 1968.

#### OTHER VARIETIES

**Froid**—Awned; winterhardy; medium height, maturity,

**Lakota**—Awned, early, medium height and lodging resistance. Resistant to stem and leaf rust, bunt, and loose smut. High yield and fair bushel weight. Quality is satisfactory for semolina products. Selected from crosses involving Sentry, Ld. 379, and Ld. 357. Released by the North Dakota Agricultural Experiment Station in 1960.

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

and lodging resistance. Moderately resistant to stem rust, susceptible to leaf rust. High yield, but lower than average bushel weight. Milling and baking characteristics are satisfactory. Selected from a population of unknown origin at the Montana Agricultural Experiment Station in 1968.

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

**Winalta**—Awned, medium height and lodging resistance. Susceptible to leaf and stem rust. Bushel weight and quality characteristics are satisfactory. Not sufficiently winterhardy. Selected from a cross of Minter and Wichita by the Canada Department of Agriculture at Lethbridge, Alberta.

Table 8. Characteristics of winter wheat varieties, 1969-71\*

Variety	Heading (date)	Plant height (inches)	Winter injury (percent)	Lodging† (score)	Leaf rust reaction‡	Stem rust reaction‡	Bushel weight (pounds)	Yield, bushels/acre		
								St. Paul	Waseca	Average
Minter	6-6	42	10	5	S	S	61.6	36	34	35
Warrior	6-3	38	15	4	S	S	59.4	40	33	37
Winoka	6-4	39	10	5	S	MR-S	61.4	38	37	38
Froid	6-3	42	12	5	S	MR-S	58.7	37	33	35
LSD 5%								5	7	4

\* Two years data from Waseca and St. Paul.

† 1 erect, 9 flat.

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

## 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. See Extension Bulletin 302 for more information.

#### RECOMMENDED VARIETIES

**Turghai**—Proso. Very early. Fair lodging resistance. Large orange seed. Introduced from Russia by the U.S. Department of Agriculture in 1903. Grow for grain.

**Empire**—Foxtail. Medium maturity. Poor lodging resistance. Very small, plump, yellow seed. Originated by Canada Department of Agriculture. Grow for hay or silage.

**White Wonder**—Foxtail. Late. Fair lodging resistance. Small white or yellow seed. Often too late for good seed production. Grow for hay or silage.

#### VARIETIES NOT ADEQUATELY TESTED

**Panhandle**—Proso. Early. Poor lodging resistance. Large white seed. Selected from white proso by the Nebraska Agricultural Experiment Station and released in 1967.

#### OTHER VARIETIES

**Akron**—Proso. Late. Poor lodging resistance. Medium size, dark orange seed. Originated by purifying seed of P.I. 222811 from Iran. Named in 1968 and released by the Colorado Agricultural Experiment Station.

**Barnyard or Japanese**—Highest yielding forage millet but very coarse. Good seed producer. Very good lodging resistance. Medium-size gray seed of low bushel weight.

**Crown**—Proso. Excellent variety but its gray-colored seed usually is not marketable. Originated by Canada Department of Agriculture.



Entomologist D. M. Noetzel examines the tall leafy growth and large heads of White Wonder forage millet.

**German, German R, and German No. 8**—Foxtail. Very late. High forage yield but too late for good seed production. Good lodging resistance. Very small yellow seed. Poor seedling vigor.

**Golden German**—Foxtail. Medium maturity. Poor lodging resistance. Small yellow seed. Much earlier than German and very uniform. Selected from German foxtail millet by Mr. Deschamps of Wray, Colorado. Named Golden German by the Colorado Agricultural Experiment Station in 1968.

**Leonard**—Proso. Late. Fair lodging resistance. Medium size tan seed. Originally P.I. 223794 from Afghanistan. Named in 1968 and released by the Colorado Agricultural Experiment Station.

**Manta**—Foxtail. Early. Short. Poor lodging resistance. Small orange seed. A selection of Manchurian released by South Dakota Agricultural Experiment Station in 1958.

**Red Proso**—(A type, not a variety). Usually Turghai or Early Fortune. Seedlots of Early Fortune tested did not differ from Turghai.

**White Proso**—(A type, not a variety). Panhandle is a variety of white proso.

Table 9. Characteristics of proso millet varieties

Variety	Seed yield/acre (pounds)		Bushel weight (pounds)	Weight/100 seeds (grams)	Rosemount 1968-71		
	Rosemount 1968-71	Elk River 1971			Heading (August)	Lodging (score)*	Height (inches)
Turghai	2,139	1,694	53.3	.56	10	2.5	39
Panhandle	2,205	—	50.0	.70	12	5.4	40
White	2,140	1,549	49.2	.70	12	5.0	38
LSD 5%	257	1,223					

\* 1 erect, 9 flat.

Table 10. Characteristics of foxtail millet varieties

Variety	Yield/acre (pounds)			Forage* protein (percent)	Heading (date)	Lodging (score†)	Height (inches)
	Rosemount 1968-70		Elk River 1971				
	Seed	Forage*	Forage*				
Empire	1,649	5,893	7,024	10.3	8-23	3.7	43
White Wonder	784	6,287	6,643	9.4	9-1	2.3	45
LSD 5%	322	723	1,187				

\* Oven-dry basis.

† 1 erect, 9 flat.

## GRAIN SORGHUM

Many hybrids are available. Most are too late for Minnesota. Even the earliest hybrids generally require drying after combine-harvest. The medium- and early-maturing 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.

The 1971 trial was planted May 28 at the rate of 150,000 seeds per acre in rows 30 inches apart. Cultivation and herbicides controlled weeds. The hybrids are ranked from earliest to latest as measured by head moisture percent on September 15.



Grain sorghum varieties differ in attractiveness to birds. The light-weight webbing is used to protect experimental plots if birdfeeding starts.

Table 11. Characteristics of grain sorghum hybrids at Lamberton, 1971

Hybrid and originator	Grain yield* per acre (pounds)	Head moisture, Sept. 15 (percent)	Bushel weight (pounds)	Height (inches)	Heading (July)
X8316, Pioneer	4,586	22.1	56.5	41	22
Minimilo 50A, Northrup King 1, Minnesota	3,755 5,993	23.6 26.1	57.5 58.9	44 60	20 23
X4027, Northrup King	4,732	27.9	57.1	46	23
Grassy Grain 1, Frontier	5,465	29.3	57.3	50	27
Minimilo 54BR, Northrup King	5,622	30.5	57.7	44	24
894, Pioneer	6,246	30.6	58.1	40	26
R-920, Acco	6,510	30.7	57.6	46	26
R-1010, Acco	7,105	31.8	59.8	56	28
121, Northrup King	6,557	31.8	58.9	46	25
120, Northrup King	5,336	32.0	57.2	49	24
125, Northrup King	5,952	32.9	56.4	50	28
A-25, DeKalb	5,999	34.5	55.7	43	25
DS-60, Payco	5,577	34.6	58.8	46	29
505, Nebraska	5,314	35.5	58.8	49	29
503, South Dakota	6,954	35.7	58.2	59	30
180, Northrup King	7,425	37.3	58.7	49	30
R-1012, Acco	5,544	38.0	59.1	40	30
883, Pioneer	5,865	39.5	57.6	44	31
133A, Northrup King	4,769	39.8	59.9	44	31
RS-506, South Dakota	6,072	40.8	58.5	53	29
LSD 5%	1,078	3.8			

\* 13% moisture basis.

## FLAX

### RECOMMENDED VARIETIES

**Linott**—Very high yield. Early, brown seed, blue flowers. High oil percent and iodine value. Immune to rust, moderately susceptible to wilt and pasmo. Released in 1967 by the Canada Department of Agriculture at Ottawa from crosses involving 770B, Argentine C, Arrow, and C.I. 974.

**Nored**—Very high yield, especially when sown early. Late, brown seed, blue flowers, resistant to lodging. More tolerant of the herbicides MCPA and dalapon than other commercial varieties. High oil percent, medium iodine value. Immune to rust, 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.

**Norstar**—Very high yield. Medium-late, resistant to lodging, brown seed, blue flowers. High oil percent, medium to low iodine value. Immune to rust, resistant to wilt, moderately resistant to pasmo. Released in 1969 by Minnesota Agricultural Experiment Station from a cross of Redwood and Crystal.

**Summit**—Very high yield. Early, brown seed, blue flowers. Medium to low oil percent, high iodine value. Immune 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. Immune 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.

### 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.

**Bison**—Medium yield. Medium-late, brown seed, blue flowers, susceptible to lodging. Medium oil percent, low iodine value. Released in 1927 by North Dakota Agricultural Experiment Station by mass selection.

**Bolley**—Medium yield. Early, brown seed, blue flowers. More susceptible to chlorosis than recommended varieties. Very high oil percent and iodine value. Immune to rust, moderately resistant to wilt, moderately susceptible to pasmo. Released in 1957 by North Dakota Agricultural Experiment Station from a cross of Birio and C.I. 1134.

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

**Marine 62**—Low yield but better than most varieties when sown late. Early, brown seed, blue flowers. Medium to low oil percent, high iodine value. Susceptible to rust, moderately resistant to wilt and pasmo. Released in 1962 by Minnesota Agricultural Experiment Station from a selection of Marine.

**Noralta**—High yield. Medium-late, brown seed, blue flowers. Very low oil percent, high iodine value. Immune to rust, moderately susceptible to wilt and pasmo. Released in 1964 at Ft. Vermilion, Canada, from a cross of Rocket and Redwing.

**Norland**—Low yield, especially when sown late. Late maturity, brown seed, white flowers with blue anthers. Medium oil percent and iodine value. Immune to rust, moderately susceptible to wilt, susceptible to pasmo. Released in 1955 by North Dakota Agricultural Experiment Station from a selection of Victory.

**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. Immune to rust, moderately susceptible to wilt, susceptible to pasmo. Released in 1954 by Canada Department of Agriculture at



Agronomist V. E. Comstock inspects a flax variety trial.

Ottawa from crosses involving Arg. M.S., F.G. 1025, and JWS 15339.

**Redwood**—High yield when sown early. Medium-late, brown seed, blue flowers. Medium oil percent and iodine value. Immune to rust, moderately resistant to wilt, moderately susceptible to pasmo. Released in 1951 by Minnesota Agricultural Experiment Station from a cross of B-5128 and Redson.

**Redwood 65**—Superior to Redwood in yield and oil percent. Similar to Redwood in maturity and appearance. More susceptible to pasmo than Redwood. Released in 1965 by University of Saskatchewan from irradiated Redwood.

Table 12. Yield of flax varieties in pounds per acre, 1967-71

No. trials	Early-sown					Late-sown					Early-late average
	St. Paul	Lamberton	Morris	Crookston	Average	St. Paul	Lamberton	Morris	Crookston	Average	
Linott	1,464	1,710	1,424	999	1,366	637	1,108	1,164	902	986	1,176
Nored	1,395	1,580	1,488	1,008	1,350	634	865	1,210	706	890	1,120
Norstar	1,390	1,696	1,470	930	1,338	520	987	1,129	872	915	1,127
Summit	1,256	1,471	1,292	990	1,228	651	1,001	1,110	892	942	1,085
Windom	1,448	1,528	1,360	849	1,281	680	966	1,160	851	944	1,112
LSD 5%	110	113	92	108	58	77	112	83	128	52	37

Table 13. Characteristics of flax varieties, 1967-71

Variety	Days from sowing to:		Plant height (inches)	Wt./1000 seeds (grams)	Lodging* (score)	Pasmo* (score)	Wilt* (score)	Major† rust genes	Oil‡ (percent)	Iodine‡ (no.)
	First bloom	Full bloom								
No. trials	29	28	29	21	10	7	9		39	39
Linott	51	58	23	5.2	4	4	6	L <sup>6</sup>	41.2	181
Nored	55	62	25	6.0	3	3	3	N <sup>1</sup>	40.7	185
Norstar	54	61	24	5.7	3	4	3	LN <sup>1</sup>	40.4	179
Summit	52	59	24	5.7	4	5	4	N <sup>1</sup>	39.2	182
Windom	52	59	22	5.5	4	5	2	N <sup>1</sup>	39.7	185

\* 1 = best, 9 = poorest; data were obtained from trials in north central flax growing area.

† All varieties immune to North America races of rust.

‡ Data were obtained from trials in north central area, no 1971 data included; oil percent calculated on an oven-dry basis.

# SOYBEANS

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

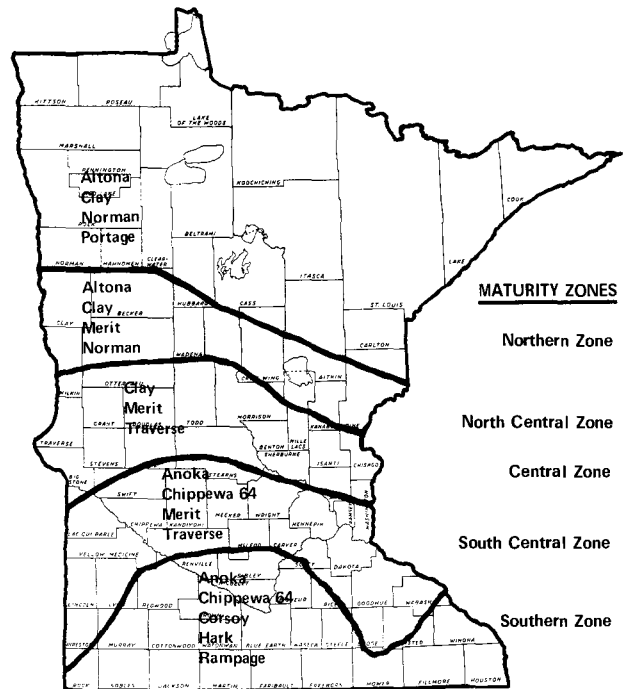
Yield data reported in table 14 for St. Paul, Crookston, Moorhead, Morris, Lamberton, and Waseca are from replicated, combine-harvested plots. The data for Grand Rapids, Fairmont, and Clear Lake are from replicated, multiple-row nursery plots. The spacing between rows was 24 inches at Grand Rapids and 28 inches at Crookston and Moorhead. At all other locations, it was 30 inches. Seeding rate in all locations was about 10 viable seeds per foot of row. Planting dates at most locations were in the last half of May. The early planting dates at Waseca and Lamberton ranged from April 29 to May 5. The very late planting dates at Lamberton were July 3 in 1970 and July 6 in 1971.

The varieties are grouped into three maturity categories. Certain transitional varieties appear in more than one maturity grouping. Comparisons should be made only within groupings, 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 15, are from locations suited to particular maturity groups. Phytophthora reactions were determined by the Department of Plant Pathology and by the U.S. Regional Soybean Laboratory, Urbana, Illinois. The chlorosis scores were obtained from plantings on a soil area near Lamberton that has free lime and a very high pH. Protein and oil determinations were made at the regional laboratory and are available for 1970 only.

## RECOMMENDED VARIETIES

**Altona**—Recommended for northern and north central



zones. Developed at the University of Manitoba from a cross of P.I. 194654 and Flambeau. Resistant to Phytophthora root rot. Released in 1966.

**Anoka**—Recommended for south central and southern zones and the southern half of the central zone. Performs well on irrigated sand and most other soils, but should not be planted on high-lime soils. Has largest seed of any recom-

Table 14. Yields of soybeans in bushels per acre

Variety	Crookston 1969, 1971	Grand Rapids 1969-71	Moorhead 1970-71	Morris 1969-71	Clear Lake 1969-70	St. Paul 1969-71	Waseca		Lamberton			Fairmont 1969, 71
							Early planting date 1969-71	Normal planting date 1969-71	Early planting date 1969-71	Normal planting date 1969-71	Very late planting date 1970-71	
<b>Early-maturing group</b>												
Portage	14	—	19	22								18
Norman	20	33	19	24								18
Altona	14	31	22	23								18
Morsoy	18	28	22	25								—
Clay	17	—	24	27								20
Merit	16	—	—	27								—
LSD 5%	3	3	2	2								3
<b>Medium-maturing group</b>												
Clay			25	27	27	28						
Merit			25	25	25	27		33		31		40
Traverse			22	26	29	25		36		30		43
Chippewa 64			—	25	27	24		36		30		46
Wirth			—	25	27	26		37		32		48
Anoka			—	28	31	30		40		31		47
Dunn			—	25	30	27		—		—		—
LSD 5%			3	2	3	3		2		2		4
<b>Late-maturing group</b>												
Chippewa 64							39	36	33	28		41
Rampage							43	37	32	27		48
Hark							43	41	36	29		51
Corsoy							45	41	37	33		52
Amsoy							43	39	35	30		54
LSD 5%							2	3	2	1		6

mended variety. Very high oil percentage. Developed at the Minnesota Agricultural Experiment Station from crosses involving Lincoln, Richland, and Korean. Released in 1970.

**Chippewa 64**—Recommended for south central and southern zones and southern one-half of the central zone. Similar in all respects, except Phytophthora resistance, to Chippewa which was selected from crosses involving Lincoln and Richland at the U.S. Regional Soybean Laboratory. Blackhawk was the Phytophthora-resistant, non-recurrent backcross parent in the development of Chippewa 64. Chippewa and Chippewa 64 have been the dominant varieties in Minnesota for more than 15 years. It is adapted to a wide range of conditions in the southern one-third of the state. Chippewa 64 was released in 1964.

**Clay**—Recommended for the north central, central, and northern zones. Outstanding in yield and oil content in its maturity class. Rather highly susceptible to Phytophthora root rot. Developed at the Minnesota Agricultural Experiment Station from a cross of Renville and Capital. Released in 1968.

**Corsoy**—Recommended for the southern zone only. Outstanding in yield among the later-maturing varieties. Has only medium resistance to lodging. Occupied a large part of the soybean acreage in southern Minnesota in 1971. Developed at the Iowa Agricultural Experiment Station from a cross of Harosoy and Capital. Released in 1967.

**Hark**—Recommended for the southern zone only. Has more erect plant type and better lodging resistance than Corsoy. Should not be planted on high lime soils. Developed at the Iowa Agricultural Experiment Station from a cross of Hawkeye and Harosoy. Released in 1966.

**Merit**—Recommended for the three central zones. Has been a popular and productive variety in central Minnesota for

more than 10 years. Adapted to a rather wide range of conditions. Only Phytophthora resistant variety in its maturity class in commercial production. Developed by the Canada Department of Agriculture at Ottawa from a cross of Blackhawk and Capital. Released in 1959.

**Norman**—Recommended for the northern and north central zones. Has good seedling vigor, is tall for its maturity, and has good tolerance to high-lime soils, but is susceptible to Phytophthora root rot. Developed at the Minnesota Agricultural Experiment Station from a cross of Acme and Har-dome. Released in 1969.

**Portage**—Recommended for the northern zone. The earliest-maturing commercial variety in the testing program. Has tendency to shatter, if harvesting is delayed. Developed at the University of Manitoba from a cross of Acme and Comet. Released in 1964.

**Rampage**—Recommended for the southern zone. Similar in maturity to Hark and Corsoy. Has better lodging resistance than these varieties, but usually yields less. Has a better tolerance to high lime soils than Hark. Developed at the Iowa Agricultural Experiment Station from a cross of Chippewa and Clark. Released in 1969.

**Traverse**—Recommended for the central and south central zones. Equal to or better than Chippewa 64 in yield and several days earlier. Should not be planted on high-lime soils. Rather highly susceptible to Phytophthora root rot. Developed at the Minnesota Agricultural Experiment Station from a cross of Lincoln and Ottawa Mandarin. Released in 1965.

#### VARIETIES NOT ADEQUATELY TESTED

**Vansoy**—A variety similar to Clay in maturity. Developed at the Ontario Agricultural College from crosses involving Lincoln, Flambeau, and Goldsoy. Released in 1970.

Table 15. Characteristics of soybean varieties

Variety	Mature (date)	Lodging resistance (score)*	Plant height (inches)	Weight of 100 seeds (grams)	Seed quality (score)*	Protein (percent)	Oil (percent)	Phytoph-thora† (reaction)	Chlorosis (score)*	Flower (color)‡	Pubes-cence (color)‡	Hilum (color)‡
Early-maturing group (average of Crookston and Morris, 1969-71)												
Portage	9- 5	1.1	22	17.1	2.8	39	22	S	3.0	P	G	Y
Norman	9- 7	1.6	23	16.3	2.7	40	22	S	1.2	P	G	Y
Altona	9- 9	1.9	22	17.8	2.9	40	21	R	3.2	P	T	B
Morsoy	9-11	2.4	27	18.9	3.5	38	23	S	2.0	P	G	Ib
Clay	9-16	1.5	23	17.1	2.7	40	23	S	1.8	P	G	Y
Merit	9-22	1.9	28	14.7	2.9	39	22	R	1.4	W	G	Bf
Medium-maturing group (average of St. Paul and Morris, 1969-71)												
Clay	9- 8	1.4	27	14.8	2.5	40	22	S	2.2	P	G	Y
Merit	9-16	2.2	34	12.5	2.2	40	20	R	1.8	W	G	Bf
Traverse	9-18	2.3	32	14.6	2.3	40	21	S	4.5	W	G	Y
Chippewa 64	9-22	2.1	34	12.6	2.3	41	20	R	1.3	P	T	B
Wirth	9-22	2.0	34	12.8	2.3	41	20	S	2.0	P	T	B
Anoka	9-23	2.8	33	16.5	2.4	40	22	S	4.8	P	T	B
Dunn	9-23	2.5	34	14.2	2.3	40	20	S	2.0	P	T	B
Late-maturing group (average of Waseca and Lamberton, normal planting date 1969-71)												
Chippewa 64	9-12	1.5	35	14.2	2.5	40	21	R	1.3	P	T	B
Rampage	9-20	1.4	35	15.2	2.2	41	21	S	2.5	P	T	B
Hark	9-20	1.9	40	17.0	2.3	41	20	S	4.8	P	G	Y
Corsoy	9-21	2.5	40	14.8	2.0	40	21	S	2.3	P	G	Y
Amsoy 71	9-27	2.5	44	17.9	2.4	39	22	R	2.3	P	G	Y

\* 1 = excellent, 5 = very poor.

† R = resistant, S = susceptible.

‡ Flower color: P = purple, W = white; pubescence color: G = gray, T = tawny; hilum color: Bf = buff, B = black, Ib = imperfect black, Y = yellow.

## OTHER VARIETIES

**Amsoy**—Several days later than Corsoy and has yielded less in all test locations except Fairmont. Selected at the 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 the Indiana Agricultural Experiment Station. Released in 1971.

**Beeson**—Similar in maturity and yield to Amsoy. Resistant to Phytophthora root rot. Developed at the Indiana Agricultural Experiment Station from crosses involving Blackhawk, Harosoy, and Kent. Released in 1968.

**Chippewa**—Similar in all respects to Chippewa 64 except in its susceptibility to Phytophthora root rot. Released in 1955.

**Dunn**—Similar in maturity and yielding ability to Anoka, but lower in oil content. Susceptible to Phytophthora root rot. Developed at the Wisconsin Agricultural Experiment Station from a cross of Chippewa and Grant. Released in 1970.

**Grant**—Slightly earlier, lower in yield, and poorer in lodging resistance than Chippewa 64. Susceptible to Phytophthora root rot. Developed at the Wisconsin Agricultural Experiment Station from a cross of Lincoln and Seneca. Released in 1954.

**Morsoy**—Between Altona and Clay in maturity. Similar in yield to Altona. Lodges considerably. Poor seed quality. Susceptible to Phytophthora root rot. Developed at the Morden Research Station, Morden, Manitoba from a cross involving Acme, Seneca, and Richland. Released in 1970.

**Ottawa Mandarin**—Similar to Traverse in maturity, but yields less. Highly resistant to lodging. Susceptible to Phy-



Agronomist J. W. Lambert crossing soybean plants. Crossing 2 soybean plants is one of the first steps in developing a new variety.

tophthora and chlorosis on high lime soils. Selected by the Canada Department of Agriculture in Ottawa from the variety Mandarin. Released about 1945.

**Wirth**—Similar in maturity to Anoka but has yielded less in Minnesota tests and has a much lower oil content. Excellent resistance to lodging, but has yielded only slightly better than Chippewa 64 and is susceptible to Phytophthora root rot. Selected at the Iowa Agricultural Experiment Station from a cross of Chippewa and Clark. Released in 1969.

## SUNFLOWERS

The commercial crop is used for birdfeed, nutmeats, salted whole seed, and oil. See Extension Bulletin 299 for more information.

### RECOMMENDED VARIETIES

**Arrowhead**—Medium to high yield. Early maturity and medium height. Seed is striped, medium in size, medium in hull, very low in oil, and medium in bushel weight. Good seedling vigor. Excellent for birdfeed production. Selected from Mammoth Russian by the Minnesota Agricultural Experiment Station. Released in 1954.

**Mingren**—Medium to high yield. Medium maturity and height. Seed is striped, very large, high in hull, and very low in oil and bushel weight. More resistant to bird damage than other recommended varieties. Large seed used for dehulled and whole seed food uses and the smaller seed for birdfeed. Selected from Mennonite by the Minnesota Agricultural Experiment Station. Released in 1964.

**Peredovik**—Medium to high yield. Late and tall. Small black seed of medium bushel weight and low hull and very high oil percentages. Excellent for the oilseed market but not for the birdfeed or whole seed food markets. Developed in Russia. Some tolerance to rust and leaf mottle diseases. Peredovik 66 is less uniform, later, taller, and slightly higher in oil.

**VNIIMK 89.31**—Medium to high yield. Late and tall. Small black seed of medium bushel weight, and low hull and very high oil percentages. Excellent for the oilseed market but not for the birdfeed or whole seed food markets. Developed in Russia. Some tolerance to rust and leaf mottle diseases. VNIIMK 89.31 66 is less uniform, later, taller, and slightly higher in oil.

### VARIETIES NOT ADEQUATELY TESTED

**D693 and D694**—Medium to high yield. Similar to Mingren in maturity, height, and use. Smaller seed of higher

bushel weight than Mingren. Partial hybrids produced by growing the two parents in alternate 4-row strips in an isolated field. The parental rows are harvested separately; one is 693 and the other 694. Developed by Dahlgren and Company, Inc. at Crookston.

**GOR 101 and 104**—Medium to high yield. Late and tall. Small black seed of medium bushel weight and very high oil percentages. Developed by Gunson Seeds, Johannesburg, South Africa.

### OTHER VARIETIES

**Armavirec**—Medium to low yield. Very early and short. Small black seed of medium bushel weight and oil percentage. Is better than Peredovik or VNIIMK 89.31 for June planting. Developed in Russia.

**Commander**—Medium yield. Similar to Mingren in maturity, height, and use. Smaller and darker seed than Mingren. Selected from Mennonite by the Morden Experimental Farm, Canada Department of Agriculture. Released in 1964.

**Greystripe and Manchurian Varieties**—Very tall and too late maturing for commercial production.

**HO1**—Medium yield. Late and tall. Small black seed of medium bushel weight and oil percentage. Developed by Northrup King and Company.

**Majak**—Medium yield. Late and tall. Small black seed of high bushel weight and low hull and very high oil percentages. Developed in Russia.

**Record**—Medium yield. Late and tall. Small black seed of medium bushel weight and low hull and very high oil percentages. Selected from VNIIMK 89.31 in Rumania.

**Saffola 120**—Medium yield. Early and short. Small black seed of medium bushel weight and oil percentage. Selected from Tchermianka by Oilseeds Development Corporation, Transvaal, South Africa.

Table 16. Yields of sunflower varieties in pounds per acre, 1969-71

Variety	Rosemount	Crookston	Grand Rapids	Average
Arrowhead	2,086	1,730	1,731	1,849
Mingren	2,063	1,592	1,560	1,738
Peredovik 66	2,033	1,752	1,653	1,813
VNIIMK 89.31 66	2,079	1,599	1,748	1,809
Majak	1,776	1,502	1,588	1,622
Record	1,709	1,741	1,697	1,716
Select	1,758	1,730	1,566	1,685
P-21 ms x HA60	2,673	1,878	1,673	2,075
LSD 5%	257	336	332	179
D-693	1,806*	1,907*	1,659*	1,791
D-694	1,851*	2,018*	1,867*	1,912
GOR 101	1,760†	1,825	2,014†	1,866
GOR 104	1,691†	1,981	1,579†	1,750
Saffola 120	1,963†	1,869†	1,130†	1,654
P-21 VR1 x HA60	2,559	2,189	1,368§	2,039
P-21 VR2 x HA60	2,364	2,122	1,730†	2,072
(P-21 VR1 x P-21 VR2) x HA60	2,419†	2,187†	1,685†	2,097
P-21 ms x HA61	2,061‡	1,407	—	1,666
Rumania hybrid 52	1,861*	1,748*	1,790*	1,800
Rumania hybrid 53	1,741*	1,733*	1,847*	1,774
Saffola hybrid 3	2,210†	1,791†	1,582†	1,861

\* 1971. † 1970-71. ‡ 1969-70. § 1970.

Table 17. Characteristics of sunflower varieties, 1969-71

Variety	Flowering (date)	Lodging (score)*	Height (inches)	Seed			
				Weight/100 (grams)	Large† (percent)	Bushel weight (pounds)	Oil‡ (percent)
Arrowhead	7-26	1.8	67	8.0	3	28.7	30.0
Mingren	7-29	2.2	69	10.9	58	22.8	26.3
Peredovik 66	8-3	2.6	74	5.8	0	28.7	44.9
VNIIMK 89.31 66	8-4	2.5	76	5.7	0	28.6	44.8
Majak	8-4	2.5	74	6.1	0	29.9	45.2
Record	8-5	2.7	78	5.2	0	28.5	44.0
Select	8-5	2.6	76	5.8	0	28.9	46.1
P-21 ms x HA60	8-1	2.2	70	6.3	0	29.0	38.4
D-693	7-29	2.4	71	9.6	31	24.4	28.6
D-694	7-29	1.8	73	10.7	37	24.7	26.8
GOR 101	8-3	2.6	72	5.8	0	29.6	44.8
GOR 104	8-2	2.9	70	5.7	0	28.2	45.3
Saffola 120	7-27	1.7	55	5.7	0	28.6	38.9
P-21 VR1 x HA60	8-1	2.0	67	6.4	0	29.3	40.6
P-21 VR2 x HA60	8-2	2.5	71	6.0	0	28.9	37.5
(P-21 VR1 x P-21 VR2) x HA60	8-2	2.8	71	6.0	0	28.9	37.9
P-21 ms x HA61	8-1	2.3	69	6.3	0	34.7	40.7
Rumania hybrid 52	8-3	2.0	69	4.8	0	26.2	44.1
Rumania hybrid 53	8-5	1.9	73	5.3	0	25.9	43.2
Saffola hybrid 3	7-31	2.3	72	6.0	0	29.8	40.9

\* 1 erect, 9 flat.

† Held on 20/64 round-hole screen.

‡ Oven-dry basis.

**Select**—Medium yield. Late and tall. Small black seed of medium bushel weight and low hull and very high oil percentages. Selected from a cross of Peredovik and VNIIMK 89.31 in Rumania.

### SUNFLOWER HYBRIDS

Hybrids are not considered for recommendation at the present time. With some hybrids, the method of seed production fails to produce a high percentage of hybrids. Other hybrids require methods involving much hand labor for roguing

seed fields; therefore, seed production is attempted in countries with low labor costs. At present, there is no assurance that a particular hybrid will be available over a period of years.

Some supposedly "hybrid" seed may contain much non-hybrid seed. Seed labeling regulations of the U.S. Department of Agriculture require that seed labeled "hybrid" must be at least 95 percent hybrid or if between 75 and 95 percent hybrid, the percent of hybrids must be shown. Therefore unless the word "hybrid" appears on the seed tag, there is no assurance of receiving hybrid seed. The data in this report are



based on seedlots that produced more than 90 percent hybrid plants.

**Hybrids of P-21 ms, P-21 VR1, and P-21 VR2 male sterile lines and HA60 and HA61 pollen-producing lines**—Medium to high yield. Medium maturity. Medium to tall. Small seed of medium to high bushel weight and low to medium oil percentage. HA60 hybrids have striped seed and HA61, black seed. P-21 VR1 and P-21 VR2 hybrids have leaf mottle (caused by *Verticillium*) resistance. HA60 and HA61 hybrids have rust resistance and HA61 hybrids have downy mildew resistance. P-21 ms, HA60, and HA61 were released in 1968 and P-21 VR1 and P-21 VR2 in 1970 by the Texas Agricultural Experiment Station—USDA.

**Rumanian hybrids 52 and 53**—Medium to high yield. Late and medium to tall. Small black seed of low bushel weight and high to very high oil percentages. Developed at the Research Institute, Bucharest-Fundulea, Rumania.

**Saffola 3 hybrid**—Medium to high yield. Medium maturity and tall. Small black seed of high bushel weight and medium oil percentage. Developed by Oilseeds Development Corporation, Transvaal, South Africa.



An industrial agronomist inspects diseased sunflowers in a downy mildew nursery. HA61 used as a parent gives mildew resistance to sunflower hybrids.

## 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. See Minnesota Extension Bulletin 300 for more information.

### RECOMMENDED VARIETIES

**Century**—Medium to early. Long vined. Large, cream-colored seed. Good cooking quality. Originated by Canada Department of Agriculture from crosses involving Chancellor, Early Raymond, and Stirling. Licensed in 1960. Grown for forage, feed grain, and soup market.

**Trapper**—Medium to early. Medium vine length. Small, cream-colored seed. Good cooking quality. Originated at the Morden Experimental Farm, Canada Department of Agriculture, from a cross of Chancellor x Weibull's 700. Released in 1970. Grown for forage, feed grain, and pigeon feed market.

### VARIETIES NOT ADEQUATELY TESTED

**Gastro**—Early. Short vined. Very large, angular, speckled salmon-colored seed. Named in 1966. Cebeco, Rotterdam, Holland.

### OTHER VARIETIES

**Chancellor**—Medium maturity. Long vined. Small, cream-colored seed. Good cooking quality. Selected at the Experimental Station, Ottawa, Canada, in 1906 from an English variety also called Chancellor. Grown for forage, feed grain, and pigeon feed market.

**Imposant**—Early. Short vined. Very large, angular, tan seed. Named in 1965. Cebeco, Rotterdam, Holland. No market in Minnesota.

**Maple**—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.

Table 18. Characteristics of pea varieties

Variety	Seed yield/acre (pounds)		Weight/100 seeds (grams)	Seed protein* (percent)	First bloom (June)	Lodging (score)†	Vine length (inches)	Sowing rate/acre (pounds)
	Elk River 1970-71	Crookston 1966-68						
Century	2,062	1,958	20.8	24.5	23	8.9	45	205
Trapper	1,821	1,619	12.1	26.6	20	9.0	30	108
Gastro‡	2,169	2,092	33.0	26.1	17	2.8	22	327
Chancellor	1,706	1,493	13.0	25.7	24	9.0	42	116
Imposant	2,431	1,544	34.5	24.4	21	7.5	21	336
LSD 5%	239	658						

\* Oven-dry basis.

† 1 erect, 9 flat at Elk River 1971.

‡ No 1966 data.

## 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 usually raise beans under contract and buy seed from the contractor.

Most of the dry beans grown in Minnesota are in the pinto

class so varietal recommendations are confined to pinto. Some varieties in the navy, great northern, pink, small red, cranberry, brown, yelloweye, and black turtle soup classes are also adapted in Minnesota but tend to yield less than the recommended pinto varieties (table 19). For more information, see Minnesota Extension Bulletin 310.

Table 19. Characteristics of dry bean market classes\* at Rosemount

Market class	Years of trial	Maturity (score)†	Weight/100 seeds (percent)*	Seed yield/acre (percent)*
Pinto	1962-71	0	100	100
Navy	1968-70	- 8	51	67
Small White	1963, 1970-71	0	44	71
Great Northern	1968, 1970-71	+ 2	88	89
Pink	1966-68, 1971	+ 5	78	81
Small Red	1966-69, 1971	- 4	88	90
Cranberry	1965-67	+11	127	80
Brown	1969-71	+ 1	109	85
Yelloweye	1962-64	+ 6	108	64
Black Turtle Soup	1965-67	+ 6	50	78
Kidney	1964-65, 1968-69	+11	130	41

\* Best variety of each class compared with UI-114 pinto in 1965-71 and UI-111 pinto in 1962-64.

† Days earlier (-) or days later (+) than pinto.



A pinto bean grower and processor inspects a field near Oslo, Minnesota.

### RECOMMENDED VARIETIES

**UI-114 Pinto**—High yield. Medium-late maturity. Large vine. Prostrate growth. Tan and brown mottled seed. Released in 1965 by the Idaho Agricultural Experiment Station.

### OTHER VARIETIES

**Columbia Pinto**—Medium yield. Medium-early maturity. Large vine. Prostrate growth. Tan and brown mottled seed. Released about 1960 by the Washington Agricultural Experiment Station—USDA.

**UI-111 Pinto**—Medium yield. Medium maturity. Large vine. Prostrate growth. Tan and brown mottled seed. Released before 1950 by the Idaho Agricultural Experiment Station.

**Wyo 166 Pinto**—Medium to high yield. Medium-late maturity. Large vine. Prostrate growth. Tan and brown mottled seed. Released in 1965 by the Wyoming Agricultural Experiment Station.

Table 20. Characteristics of pinto bean varieties at Rosemount, 1965-71

Variety	Mature (August)	Weight/100 seeds (grams)	Seed yield/acre (pounds)
UI-114	30	37.1	2,671
UI-111	25	34.7	2,135
LSD 5%			119

## ALFALFA

Many alfalfa varieties are available from both private and public plant breeders. Realistic varietal recommendations cannot be made. Variety descriptions and performance data are given to provide a basis for alfalfa growers to select varieties that suit their needs. When selecting a variety, study the data available and consider the following factors:

**WINTERHARDINESS**—Severe Minnesota winters make winterhardiness a primary consideration in variety selection. Under favorable conditions, less hardy varieties will survive. But under more severe conditions, less hardy varieties will yield less than winterhardy varieties, even the first year after seeding.

**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 economic 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. Infected plants are more susceptible to winter-killing. Stand reductions after winter often are due to a combination of wilt damage and winter injury.

**OTHER DISEASES**—Common leafspot, blackstem, and lepto leafspot are important foliar diseases in Minnesota. Losses from these diseases are often more difficult to recognize than bacterial wilt. Resistance to these diseases should be considered in selecting varieties. Another disease, *Phytophthora* root rot, is important on poorly drained soils, but resistant varieties will not be available for two or more years.

**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. Resistance to potato leafhopper should be considered when selecting varieties.

**FORAGE YIELD**—The ultimate value of a variety depends upon total forage yield. Most varieties will yield well, but some are consistently high yielders. The yield potential of all varieties is influenced by inherited characteristics such as winterhardiness, disease resistance, and insect resistance. Environment (including soil fertility, climate, and management) also influences yield. Top yields are obtained only when all these factors are favorably combined.

This report lists only those varieties where certified seed is available.



Pathologist F. I. Frosheiser and students rating roots of alfalfa varieties for resistance to bacterial wilt.

### CLASSIFICATION OF ALFALFA VARIETIES

#### Very winterhardy, wilt-resistant varieties

Varieties in this group are characterized by exceptional winterhardiness, slower recovery after cutting, early dormancy in late August, and little growth after a second harvest. First-crop yields are normally competitive with other varieties, but slow recovery makes second cuttings later than normal. The third crop is usually small due to early dormancy.

#### Winterhardy, wilt-resistant varieties

This group exhibits good hardiness even under severe winter conditions. Average recovery after cutting with normal fall regrowth and average dormancy. Bacterial wilt resistance ranges from moderately resistant varieties, such as Ranger, to high resistance in Iroquois. Forage yields vary between varieties but are usually adequate for economic production.

#### Winterhardy, wilt-susceptible varieties

These varieties are sufficiently hardy to survive severe winters. They maintain adequate stands when wilt is not a factor, but stands and yields will be poor when plants are infected with the wilt organism.

#### Moderately winterhardy, wilt-resistant varieties

Varieties in this group are resistant to bacterial wilt but are less hardy than those in the hardy, resistant group above. Following a mild winter and/or good snow cover, they will respond like the winterhardy, wilt-resistant group, but severe winter conditions will reduce stands and yield.

#### Moderately winterhardy, wilt-susceptible

This group is generally characterized by rapid recovery after harvest, more fall growth, and less winterhardiness than the winterhardy wilt-resistant group. Many varieties in this

group are Flemish varieties introduced from Europe and are completely susceptible to bacterial wilt. When neither winter injury nor wilt are factors, they perform quite well. After a severe winter or when plants are infected with wilt, yields will be considerably lower. Yields the first year after seeding are normally good, but usually decline in succeeding years. Even the first year after seeding, yields can be low following a severe winter. Minnesota trials have seldom shown any advantage for this group, even when winter injury and wilt were not factors.

The data in table 21 demonstrate the usual performance in Minnesota of moderately hardy, bacterial wilt-susceptible varieties as compared to winterhardy, wilt-resistant varieties. The data were collected from 1965 and 1966 seedings at Rosemount. There was little winter injury during the winters of 1965-66 and 1966-67, but rather severe killing during the winter of 1967-68.

#### Nonhardy varieties

These varieties are not sufficiently winterhardy to be grown in Minnesota except for plowdown in the seeding year. Varieties in this group are: African, Bonanza, Caliente, Caliverde, Caliverde 65, Delta, El-Unico, Florida 66, Hairy Peruvian, Hayden, Joaquin 11, Mesa Sirsa, Mesilla, Moapa, Moapa 69, Sonora, Sonora 70, 183, WL 504, WL 508, and Unico.

Yield data from variety tests in Minnesota since 1965 and from North Dakota Agricultural Experiment Station at Fargo have been summarized in table 22. The data represent statistical comparisons of each variety with the yield of Vernal in the same test. Yield differences of about .5 ton per acre are required for varieties to differ significantly from Vernal. Vernal was chosen as a check variety, because it has performed well throughout Minnesota during the last 20 years. These data can be used to project the frequency with which a given variety can be expected to produce more, the same, or less forage than Vernal. For example, in 65 years in southern Minnesota, the variety Ranger yielded significantly more than Vernal in only two test years; it yielded equal to Vernal in 52 test years and less than Vernal in 11 test years. Therefore, in about 1 out of 6 years in southern Minnesota, Ranger will yield less than Vernal. In the remaining 5 years, the yields of Ranger and Vernal will be similar.

Most of the moderately winterhardy, wilt-susceptible varieties yielded less than Vernal in about 1 out of 5 test years where there was little stand depletion. The data in table 22 include bias, because stand depletion was usually severe enough that after 2 or 3 years, the tests were discarded.

Varieties are classified in table 23 for recovery after first cutting and fall growth habit plus resistance to bacterial wilt, foliar diseases, and leafhopper yellowing. Generally the higher the percent resistant plants in a variety, the greater the assurance that a variety will produce maximum yields of high quality forage.

Table 21. Forage yields in tons of hay per acre from moderately winterhardy, bacterial wilt-susceptible alfalfa varieties and winterhardy, wilt-resistant varieties before and after the severe winter of 1967-68

Variety description	Seeded in 1965			Seeded in 1966	
	1966	1967	1968	1967	1968
<u>Moderately winterhardy, wilt-susceptible</u>					
Average of 10 varieties	5.60	5.01	0.18	5.12	3.83
<u>Winterhardy, wilt-resistant</u>					
Ranger	4.85	4.96	2.73	4.96	4.50
Vernal	5.25	5.11	3.93	5.06	4.32



Table 23. Recovery after first cutting, fall growth habit, disease resistance, and insect resistance characteristics of alfalfa varieties under Minnesota conditions

Variety according to winter-hardiness	Recovery after June cut* (score)	Fall growth† (score)	Bacterial wilt‡ (% res.)	Common leafspot§ (% res.)	Lepto leafspot§ (% res.)	Spring blackstem§ (% res.)	Leafhopper yellowing§ (% res.)
<b>Very winterhardy</b>							
Beaver	6.2	7.4	28	26	8	36	38
Norseman	6.0	7.9	34	34	10	27	36
Teton	6.3	7.4	17	51	6	30	61
Travois	7.0	7.4	42	42	7	44	72
<b>Winterhardy</b>							
ATRA 55	3.5	6.0	27	44	33	22	30
Cayuga	4.5	5.1	21	40	6	37	39
Dawson	5.4	6.5	16	32	13	22	18
Iroquois	4.2	6.0	69	44	10	40	26
Ladak	—	—	9	22	7	23	43
Ladak 65	5.0	6.0	40	16	4	29	23
Mark II	5.2	5.8	1	26	16	37	20
Narragansett	5.4	5.9	>1	44	11	44	24
Progress	4.4	5.4	29	18	9	18	39
Ranger	4.5	5.4	16	11	1	7	16
Scout	3.7	5.8	13	30	9	19	32
Team	4.0	5.4	>1	51	10	38	59
Titan	5.0	6.4	68	31	16	60	47
Weevlchek	4.0	5.5	64	47	22	38	74
WL 202	4.7	6.0	39	7	12	39	29
WL 210	—	—	13	1	19	21	51
WL 215	—	—	40	23	15	38	23
123	4.0	6.3	46	8	22	39	51
153	4.5	5.7	2	7	5	19	27
520	—	5.6	45	25	17	42	42
522	4.7	5.3	45	15	10	40	30
525	4.7	5.7	43	29	24	52	21
Vernal	5.5	6.5	47	23	14	41	29
<b>Moderately winterhardy</b>							
A24	4.0	4.2	5	64	3	28	25
A59	4.4	5.0	18	21	12	42	18
Apex	3.5	4.6	>1	48	10	20	28
Arnim	4.4	4.7	>1	66	15	42	15
Cardinal	3.5	3.2	>1	76	11	13	18
DuPuits	4.0	3.0	>1	76	5	21	18
Europa	3.5	3.3	>1	81	12	21	20
Glacier	4.0	4.4	>1	56	16	42	24
Kanza	—	—	72	9	19	28	26
Orchies	3.5	3.5	>1	88	12	28	36
Saranac	3.5	4.5	55	49	18	37	20
Stride	3.7	3.0	2	58	7	17	31
Tempo	3.0	5.1	29	42	11	19	31
Thor	—	4.5	80+	—	—	—	—
Warrior	3.5	4.3	22	55	12	26	16
WL 303	3.7	4.3	12	22	20	32	37
WL 305	—	—	25	13	9	47	36

\* Rate of recovery after 1st cutting scored 1 to 9: 1 = fastest, 9 = slowest.

† Fall growth after cutting in 1st week of September scored 1 to 9: 1 = tallest, 9 = shortest. This is a general indication of winter-hardiness. Those with low numbers are usually less winterhardy than those with higher numbers.

‡ Plants within each variety scored for bacterial wilt from 0 to 5: 0 = no symptoms, 5 = plant dead. Percent resistant plants (% res.) is based on the number of plants in 0 and 1 categories.

§ Plants within each variety scored for degree of injury from 1 to 5: 1 = no injury, 5 = severe injury. Percent resistant plants (% res.) is based on the number of plants in 1 and 2 categories.

## 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

**Empire**—Winterhardy, prostrate growth habit. Released by New York Agricultural Experiment Station.

### VARIETIES NOT ADEQUATELY TESTED

**Carrol**—Winterhardy, prostrate, persistent pasture type. Slightly earlier in maturity, better seedling vigor and larger seed than Empire. Released in 1970 by Iowa Agricultural Experiment Station. Seed supply very limited.

**Leo**—Winterhardy, higher yielding, less prostrate growth habit, and better seedling vigor than Empire. Released by MacDonald College, Quebec, Canada. Seed supply very limited.

## RED CLOVER

Red clover is grown in association with timothy for hay or silage. Winterhardy varieties will generally not persist beyond two crop years because of susceptibility to crown rot and other diseases. Red clover should not be seeded with alfalfa because red clover seedlings are more aggressive than alfalfa seedlings and may prevent alfalfa from becoming established. Where alfalfa can be grown successfully, it will yield more than red clover.

### RECOMMENDED VARIETIES

**Dollard**—Persistent with good forage yield in second crop year. Resistant to northern anthracnose but susceptible to powdery mildew. Released by MacDonald College, Quebec, Canada.

**Lakeland**—Fairly persistent with good forage yield in second crop year. Highly resistant to powdery mildew and resistant to northern anthracnose and virus. Released in 1959 by Wisconsin Agricultural Experiment Station in cooperation with U.S. Department of Agriculture.

### OTHER VARIETIES

**Kenland**—Very susceptible to northern anthracnose and virus. Released by Kentucky Agricultural Experiment Station

### OTHER VARIETIES

**Viking**—Less winterhardy than Empire, upright. Released by New York Agricultural Experiment Station.

Table 24. Dry matter yields of birdsfoot trefoil varieties in tons per acre

Variety	Crookston	Grand Rapids	Lamberton	Rosemount
No. trial years	2	2	2	3
Carrol	3.60	2.10	2.65	3.30
Empire	2.97	1.96	2.02	2.89
Leo	3.02	2.58	2.89	3.27
Viking	2.60	2.27	2.60	2.43
LSD 5%	.38	.38	.47	.43

in cooperation with U.S. Department of Agriculture.

**Pennscott**—Very susceptible to northern anthracnose and virus. Released by Pennsylvania Agricultural Experiment Station.

Table 25. Dry matter yields of red clover varieties in tons per acre

Variety	Grand Rapids	Rosemount*	Waseca	Grand Rapids percent stand†
No. trial years	3	1	1	
Dollard	3.45	2.48	2.46	73
Kenland	3.40	2.47	2.83	16
Lakeland	3.55	2.42	2.48	78
Pennscott	3.26	2.41	2.56	15
LSD 5%	.20	.21	.60	

\* One harvest.

† Reflects winter survival.

## BROMEGRASS

Bromegrass is generally grown 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. All of the recommended varieties are of the southern type and are satisfactory in winterhardiness under Minnesota conditions.

### RECOMMENDED VARIETIES

**Baylor**—Leafy, good seedling vigor. Developed and distributed by Rudy-Patrick Seed Co.

**Fox**—Spreading, good seedling vigor, good tolerance to leaf diseases. Maturity similar to Lincoln. Released in 1968 by Minnesota Agricultural Experiment Station. Limited seed available in 1972.

**Lincoln**—Spreading, good seedling vigor. Released in 1942 by Nebraska Agricultural Experiment Station in cooperation with U.S. Department of Agriculture.

**Sac**—Leafy, moderately coarse, good tolerance to leaf diseases. Released in 1962 by Wisconsin Agricultural Experiment Station in cooperation with U.S. Department of Agriculture.

**Saratoga**—Leafy, good aftermath production. Released in 1955 by New York Agricultural Experiment Station.

Table 26. Dry matter yields of bromegrass varieties in tons per acre

Variety	Crookston	Grand Rapids	Lamberton	Rosemount
No. trial years	2	4	3	4
Baylor	2.77	3.73	3.20	3.53
Fox	2.62	4.05	3.08	3.48
Lincoln	2.55	3.64	3.00	3.39
Sac	2.67	3.70	3.03	3.65
Saratoga	2.69	4.18	3.23	3.53
LSD 5%	.43	.43	.36	.31

## 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 mineral 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 by heading to early bloom stage is preferred, because the quality declines with advanced maturity. The recommended varieties in Minnesota tests are similar in maturity and yield performance. All appear winter-hardy and persistent.

Table 27. Dry matter yields of reed canarygrass varieties in tons per acre

Variety	Crookston	Grand Rapids	Lamberton	Morris	Rosemount	Waseca
	No. trial years	1	5	2	2	8
Frontier	2.55	4.20	2.59	1.84	3.75	3.22
Ioreed	2.68	4.03	2.04*	2.09	3.95	3.15
Rise	2.64	4.19	2.66	2.12	3.83	3.15
LSD 5%	.51	.22	.21	.27	.31	.40

\* Data from one trial year.

### RECOMMENDED VARIETIES

**Frontier**—Slightly later in maturity and leafier than Ioreed. Released in 1959 by Canada Department of Agriculture, Ottawa.

**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 by Iowa Agricultural Experiment Station.

**Rise**—Stand establishment better and slightly later in maturity than Ioreed. Generally free of leaf diseases under Minnesota conditions. Developed and distributed by Rudy-Patrick Seed Co.



Agronomist R. E. Barker observes differences in heading date among reed canarygrass clones.

## TIMOTHY

Timothy is adapted throughout Minnesota. It is used both in hay and pasture mixtures. When timothy is the major component in hay, its stage of maturity affects yield, quality, and grade. 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.

### RECOMMENDED VARIETIES

**Climax**—Tall, fine-stemmed, leafy, medium-late maturity. Released in 1947 by Canada Department of Agriculture, Ottawa.

**Itasca**—Less leafy than Climax, medium maturity. Well adapted throughout Minnesota. Released by Minnesota Agricultural Experiment Station.

**Lorain**—Medium-late maturity. Released in 1939 by Ohio Agricultural Experiment Station in cooperation with U.S. Department of Agriculture.

### OTHER VARIETIES

**Clair**—Relatively coarse, vigorous, and extremely early. Released in 1958 by Kentucky Agricultural Experiment Station.

**Drummond**—Relatively tolerant to rust, medium-late maturity. Released by MacDonald College, Quebec, Canada.

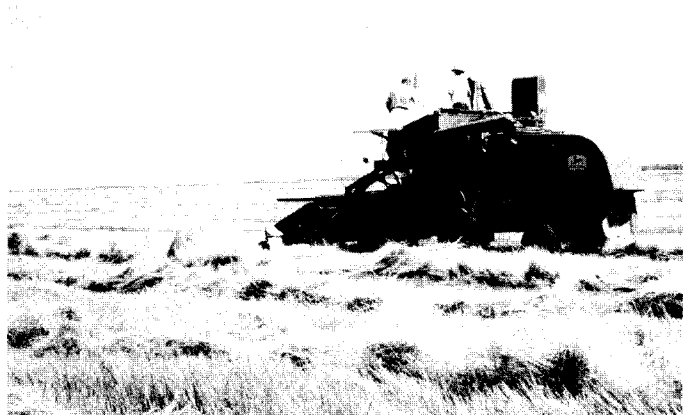
**Essex**—Forage relatively disease-free, leafy, and very late maturity. Released in 1955 by New York Agricultural Experiment Station.

**Verdant**—Leafy, relatively disease free, but low yielding, late maturity. Released in 1968 by Wisconsin Agricultural Experiment Station in cooperation with U.S. Department of Agriculture.

Table 28. Dry matter yields of timothy varieties in tons per acre

Variety	Crookston	Grand Rapids	Rosemount
	No. trial years	2	5
Clair	3.66	3.87	3.89
Climax	3.62	3.74	3.72
Drummond	3.54	3.42*	3.71
Essex	3.19	3.51	3.53
Itasca	3.79	3.90	3.55
Verdant	3.60	3.64	3.02
LSD 5%	.71	.23	.42

\* Mean of two trial years.



Combine-harvesting a certified grass seed field in Rouseau County.

## 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* in pounds	Rate/acre in 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		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		Early spring to August 10
Alone		8-12	
With grasses		5-8	
Birdsfoot trefoil (with grasses)	60	5-6	Early spring
Clover	60		Early spring
Alsike (in mixture)		2-4	
Ladino (in mixture)		½-1	
Red (in mixture)		4-8	
Sweet Clover	60		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)		May 20 to June 5 for grain
18- to 40-inch rows		5-10	
6- to 14-inch rows		7-15	
Sudangrass	40		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		May
6- to 7-inch rows		120 (4 seeds/ft.)	
20-inch rows		90 (10 seeds/ft.)	
30-inch rows		75 (11 seeds/ft.)	
40-inch rows		60 (12 seeds/ft.)	
Wheat	60		
Hard Red Spring		75-90	Early spring
Durum		90	Early spring
Winter		75-90	Aug. 20 to Sept. 20
Miscellaneous Crops			
Annual canarygrass	50	40-50	Early spring
Buckwheat	48-50	40-48	June 15 to July 15
Field peas	60	120-225	Early spring
With 1½ to 2 bushels of oats		45-90	
Horsebean—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 — June 15
Navy beans	60	40	May 20 to June 15
Pinto beans	60	60-80	May 20 to June 15
Rape for forage	50	4-6	Early spring with oats
Sunflowers	24	4-8	May 1-25

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