

Miscellaneous Report 24  
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# VARIETAL TRIALS OF FARM CROPS

Agricultural Experiment Station  
University of Minnesota



# 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, and Grand Rapids, 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 results from 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.

For most crops, varieties 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 developed in other states or countries 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.

The use of certified seed of recommended varieties is recommended. 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 of a variety.

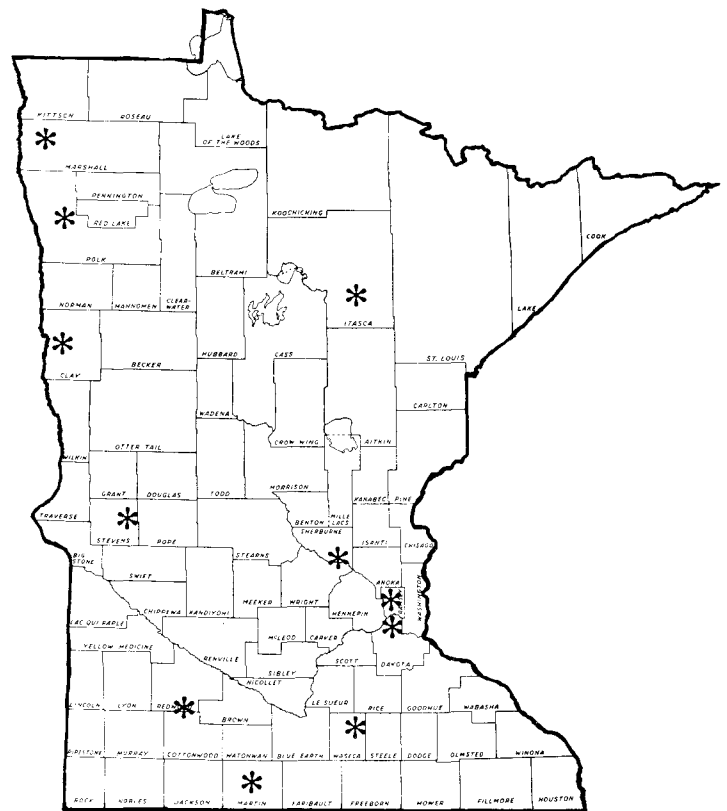
Registered and certified seed of most varieties described in this report can be purchased from seed dealers or from growers listed in the Minnesota Registered and Certified Seed Directory for 1970 Planting. This annual publication can be obtained without charge from the Minnesota Crop Improvement Association, St. Paul, Minnesota 55101, or from county extension agents' offices.

Authors of this publication are: barley, D. C. Rasmusson; oats, D. D. Stuthman and O. D. Smith; spring and winter wheat, R. E. Heiner; rye, millet, grain sorghum, peas, and sunflowers, R. G. Robinson; flax, V. E. Comstock and J. H. Ford; soybeans, J. W. Lambert; alfalfa, L. J. Elling and D. K. Barnes; birdsfoot trefoil, red clover, sweet clover, bromegrass, and timothy, H. L. Thomas; sudangrass, sorghum-sudan, and sweet sorghum, A. R. Schmid. Extension agronomists H. J. Otto and E. A. Oelke also participated in preparation of this publication.

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, J. R. Lofgren, and R. H. Anderson, respectively.

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1969 varietal trials were conducted at these locations.

## BARLEY

### RECOMMENDED VARIETIES

**Conquest**—Six-rowed, smooth-awned, blue aleurone variety. Long rachilla hairs. High yield, good standing ability. Highly resistant to loose smut. A malting variety. Developed at Brandon, Manitoba, from crosses involving Vantage, Jet, Vantmore, Br. 4635-4456, U.M. 570, and Parkland.

**Dickson**—Six-rowed, rough-awned, colorless aleurone variety. Short rachilla hairs. High yield, good standing ability. Has resistance to prevalent leaf spotting diseases. Kernel plumpness inferior to Larker. Yields more than Larker when planted late. A malting variety. Developed at North Dakota State University from crosses involving Traill, Kindred, and CI 7117-77.

**Larker**—Six-rowed, semi-smooth awned, colorless aleurone variety. Long rachilla hairs. High yield, good standing ability, and excellent kernel plumpness. A malting variety. Originated at North Dakota State University from a cross of Traill and a selection from U.M. 570.

**Primus II**—Six-rowed, smooth-awned, colorless aleurone variety. Long rachilla hairs. Good kernel plumpness. Early maturing. Malting quality status undetermined. Developed at the South Dakota Agricultural Experiment Station from crosses involving Brandon 3902, Liberty, and Swan.

### VARIETIES NOT ADEQUATELY TESTED

**Paragon**—Six-rowed, smooth-awned, blue aleurone variety. Long rachilla hairs. Similar to Conquest in yield and standing ability, but matures later. Resistant to stem rust and loose smut. Quality status in the U. S. undetermined. Approved for malting in Canada. Developed at Brandon, Manitoba, from a cross of Br. 7212 and Parkland.

Table 1. Yield in bushels per acre of Dickson and Larker when planted early and late at Crookston

Variety	Early planting			Late planting		
	1965	1966	Average	1965	1966	Average
Larker	76	46	61	38	22	30
Dickson	79	47	63	56	31	43

Table 2. Yield of barley varieties in bushels per acre, 1963-69

Variety	No. of trials:	Morris	Crookston	St. Paul	Rosemount	Lamberton	Stephen	Average of 42 trials
		12	11	9	5	4	1	
Dickson		60	66	53	61	69	75	61
Larker		60	64	52	61	64	67	60
Conquest		63	61	59	62	69	59	62
LSD 5%		3	4	4	4	5	13	2

Table 3. Yield of barley varieties in bushels per acre

	Morris	Crookston	St. Paul	Rosemount	Lamberton	Stephen	Average
Colorless aleurone varieties, 1966-69							
No. of trials:	7	6	4	3	2	1	23
Dickson	59	69	69	67	79	75	67
Larker	59	68	58	67	74	67	64
Primus II <sup>1</sup>	57	69	78	66	80	55	67
LSD 5%	5	5	7	6	8	13	3
Blue aleurone varieties, 1965-69							
No. of trials:	7	6	5	2	1	1	22
Conquest	62	65	68	70	76	59	65
Paragon	62	64	72	69	74	60	66
LSD 5%	5	5	6	8	9	13	3

<sup>1</sup> Primus prior to 1969.

### OTHER VARIETIES

**Kindred**—Six-rowed, rough-awned, colorless aleurone variety. Short rachilla hairs. Low yield and highly susceptible to lodging. A malting variety. Selected by a farmer, S. T. Lykken of Kindred, North Dakota.

**Parkland**—Six-rowed, smooth-awned, blue aleurone variety. Long rachilla hairs. Inferior to Conquest in yield and standing ability. A malting variety. Originated in Canada from crosses involving Ollie, Montcalm, and Brandon 1136.

**Traill**—Six-rowed, rough-awned, colorless aleurone variety. Short rachilla hairs. Has good standing ability and high yield. Tends to produce low percentage of plump kernels. A malting variety. Developed at North Dakota State University from a cross of Kindred and Titan.

**Trophy**—Six-rowed, rough-awned, colorless aleurone variety. Long rachilla hairs. Good kernel plumpness. Stands well and is medium in yield. A malting variety. Developed at North Dakota State University from a cross of Traill and a selection from U.M. 570.



M11 experimental barley variety and agronomist D.C. Rasmusson.

Table 4. Characteristics of barley varieties, 1966-69

Variety	Date of heading (June)	Height (inches)	Lodging <sup>2</sup>	Plump kernels <sup>3</sup> (percent)	Disease Reaction <sup>4</sup>		
					Stem rust	Leaf spotting	Loose smut
Dickson	24	34	3.3	51	R	R	S
Larker	22	35	4.0	74	R	S	S
Conquest	24	39	2.8	66	R	S	R
Primus II <sup>1</sup>	18	35	3.0	76	R	S	S
Paragon	26	37	2.9	59	R	S	R

<sup>1</sup>Primus prior to 1969, <sup>2</sup>1 erect, 9 flat, <sup>3</sup>Percent kernels held on 6/64" X 3/4" screen, <sup>4</sup>R = resistant, S = susceptible.

## OATS

### RECOMMENDED VARIETIES

**Garland**—Midseason, good yield, short, fair straw strength, good test weight. Susceptible to crown rust. Selected at the Wisconsin Agricultural Experiment Station from crosses involving Clintland, Garry, Hawkeye, and Victoria.

**Lodi**—Late, excellent yield and standing ability, tall, good test weight. Some resistance to crown rust. Developed in Wisconsin from crosses involving Richland, Bond, Garry, Hawkeye, and Victoria.

**Portal**—Midseason to late, excellent yield, moderately tall, fair straw strength, good test weight. Some resistance to crown rust. Selected from a cross of P.I. 174544 and Garland at the Wisconsin Agricultural Experiment Station.

**Sioux**—Late, excellent yield, medium height, poor straw strength and test weight. Susceptible to crown rust. Selected in Canada from a cross of Garry and Rex.

### OTHER VARIETIES

**Dawn**—Early, good yield, tall, good test weight, poor straw strength. Susceptible to crown rust. Developed and released by the North Dakota Agricultural Experiment Station from a cross involving several lines.

**Garry**—Late, good yield, tall, good test weight, fair straw strength. Susceptible to crown rust. Developed in Canada from crosses involving Victory, Hajira, and Banner.

**Holden**—Midseason, good yield, straw strength, and test weight. Susceptible to crown rust. Developed in Wisconsin from the same cross as Garland to which it is similar.

**Iowa Early Multiline (E68, E69)**—Early, fair yield, short, good straw strength and test weight. Heterogeneous crown rust reaction, susceptible to smut. Developed in Iowa. The recurrent parent is selection CI 7970.



Agronomist D.D. Stuthman compares Kelsey and Sioux oat varieties at Morris.

**Iowa Midseason Multiline (M68, M69)**—Midseason, excellent yield, medium height, good straw strength and test weight. Heterogeneous crown rust reaction, susceptible to smut. Developed in Iowa. The recurrent parent is CI 7555, a Clintland type.

**Jaycee**—Early good yield, short, good test weight, poor straw strength. Susceptible to crown rust. Released by the Illinois Agricultural Experiment Station from crosses involving Clintland, Garry, Hawkeye, Victoria, and Putman.

Table 5. Yields of oat varieties in bushels per acre for 1967-69; varieties arranged in order of maturity from early to late

Variety	Rosemount	Waseca	Lamberton <sup>1</sup>	Morris	Crookston <sup>2</sup>	Grand Rapids	Average of 6 locations	Stephen <sup>3</sup>
E 69 <sup>4</sup>	78	80	94	87	69	53	77	
Minhafer	88	80	89	74	74	69	79	
Garland	78	72	91	93	91	78	84	81
M 69	92	83	104	94	68	86	88	64
Portal	92	84	98	89	84	83	88	73
Kota	87	80	101	109	82	92	92	86
Sioux	92	87	104	114	109	97	100	110
Kelsey	88	83	103	112	108	84	96	81
Lodi	88	82	98	99	102	90	93	94
LSD 5%	6	8	9	8	10	7	3.3	13

<sup>1</sup> 1967 and 1969.

<sup>2</sup> 1968 and 1969.

<sup>3</sup> 1969 only — not included in average

<sup>4</sup> Morris, 1968 and 1969. Crookston and Grand Rapids, 1969.

**Kelsey**—Late, good yield, moderately tall, fair straw strength, poor test weight. Some crown rust resistance. Selected in Canada from crosses involving Victoria, Hajira, Banner, Roxton, Beacon, and Rodney.

**Kota**—Midseason to late, excellent yield, moderately tall, poor straw strength, good test weight. Slight resistance to crown rust, resistant to "red leaf" virus. Developed at South Dakota from crosses involving Clinton, Landhafer, RL 2120, and Garry.

**Minhafer**—Early, good yield, test weight, and straw strength. Only variety with some resistance to the most prevalent race (6AF) of oat stem rust. Some resistance to crown rust. Developed at the Minnesota Agricultural Experiment Station from crosses involving Landhafer, Bond, Rainbow, Hajira, and Joannette.

**O'Brien**—Early, poor yield and straw strength, medium height, good test weight. Susceptible to crown rust. Selected at the Iowa Experiment Station from crosses involving Victoria, Hajira, Banner, Victory, Roxton, and Clintland.

**Orbit**—Midseason to late, excellent yield, fair straw strength, poor test weight. Small resistance to crown rust. Developed by the New York Agricultural Experiment Station from crosses involving Alamo, Garry (Sel. 5), Goodwin, Victoria, and Rainbow.

**Rodney**—Late, good yield, tall, poor straw strength and test weight. Slight resistance to crown rust. Developed in Canada from crosses involving Victoria, Hajira, Banner, Victoria, and Roxton.

**Stormont**—Midseason to late, fair yield, excellent straw strength, poor test weight. Susceptible to crown rust. Developed from crosses involving Shield, Garry, and Klein by the Canada Department of Agriculture.

**Tippecanoe**—Early, poor yield, short, good straw strength. Susceptible to crown rust. Released from Purdue Agricultural Experiment Station from crosses involving Clintland 60 and Mo. 0-205.

**Wyndmere**—Early, excellent yield, good test weight, poor straw strength. Susceptible to crown rust. Developed by the North Dakota Agricultural Experiment Station from a cross of Ajax and Ransom.

Table 6. Characteristics of oat varieties, 1967-69

Variety	Heading date	Lodging score <sup>1</sup>	Height (inches)	Bushel weight (pounds)	Groat <sup>2</sup> (percent)	Reactions to Disease			Septoria leaf spot	
						Stem rust <sup>4</sup>	Crown rust	Smut		Red leaf virus
E 69	6-21	2.9	37	35	74	S	R,S	S	S	MR
Minhafer	6-24	3.6	40	33	73	MS	MS	R	S	MR
Garland	6-26	5.1	36	33	75	S	S	R	MS	R
M 69	6-26	3.8	40	34	75	S	R,S	S	MS	MR
Portal	6-28	3.5	41	33	75	S	MS	R	S	MS
Kota	6-29	5.3	41	32	72	S	MS	R	R	MS
Sioux	6-30	5.4	40	30	72	S	S	R	MS	MS
Kelsey	7-1	4.8	42	31	72	S	MS	R	MS	VS
Lodi	7-2	3.3	46	32	73	S	S-MS	MR	S	MR

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

<sup>2</sup> 1968-69. This may be more important than test weight; however, the two characters are positively correlated.

<sup>3</sup> R resistant, MR moderately resistant, MS moderately susceptible, S susceptible.

<sup>4</sup> Race 6AF has been the most prevalent stem rust race for 5 years. Nearly all oat varieties grown in Minnesota are susceptible to 6AF.

## WINTER RYE

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

### RECOMMENDED VARIETIES

**Frontier**—High yield, very winterhardy, medium maturity, tall. Poor resistance to lodging. Small seed, predominantly blue-gray in color, 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.

**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 Experimental Farm, Swift Current, Saskatchewan, under the name Pearl, and thought to originate from seed imported from Denmark about 1952.

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

Table 7. Yields of winter rye varieties in bushels per acre

Variety	Rosemount 1967-69	Waseca 1968-69	Lamberton 1969	Morris 1968-69	Grand Rapids 1968-69	Average of 5 locations
Frontier	46	53	61	62	64	57
Pearl	56	50	60	67	66	60
Von Lochow	53	58	65	72	71	64
Cougar	51	54	67	68	68	62
Caribou	39	38	52	50	54	47
Elk	51	50	61	65	71	60
LSD 5%	3	10	5	6	6	3

### VARIETIES NOT ADEQUATELY TESTED

**Cougar**—High yield, winterhardy, late, medium height. Very good resistance to lodging. Small seed of green and tan color, 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.

### OTHER VARIETIES

**Antelope**—Appears identical to Caribou, its sister selection, except it has yielded less in Minnesota. Released by the University of Saskatchewan in 1952.

**Caribou**—Medium yield, very winterhardy, early, tall. Small seed, somewhat mixed in color, medium bushel weight. A Crown rye selection obtained from the University of Saskatchewan in 1949. Named and released by the University of Minnesota in 1953.

**Elk**—High yield, fair winterhardiness, late, tall. Medium-size seed, predominantly green in color, medium bushel weight. Originated from a small lot of seed obtained in 1953

from the Cereal Crops Division, Canada Department of Agriculture. Named and released by the University of Minnesota in 1959.



The two strongest-strawed rye varieties — Von Lochow and Cougar — and agronomists E.A. Oelke and R.G. Robinson at Waseca.

Table 8. Characteristics of winter rye varieties, 1967-69

Variety	Winterkill	Date of heading	Date mature	Plant height	Lodging <sup>1</sup>	Weight of 100 seeds	Bushel weight
	percent		July	inches		grams	pounds
Frontier	6	5-30	28	54	5.1	2.3	55.6
Pearl	8	6-1	29	53	3.5	2.4	54.5
Von Lochow	15	6-3	30	50	1.9	2.7	55.5
Cougar	5	6-1	30	49	2.2	2.3	54.5
Caribou	6	5-29	27	54	3.4	2.3	55.1
Elk	10	6-2	29	53	3.7	2.6	54.9

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

## HARD RED SPRING WHEAT

### RECOMMENDED VARIETIES

**Chris**—Awnless variety of medium height, straw strength, and maturity. Resistant to leaf and stem rust. High yielding with very good test weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Frontana, Kenya 58, Newthatch, and Thatcher at the Minnesota Agricultural Experiment Station.

**Manitou**—Awnless variety of medium height, straw strength, and maturity. Resistant to stem rust but moderately susceptible to leaf rust. High yielding with good test weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Thatcher, Frontana, Canthatch, and P.I. 170925 by the Canada Department of Agriculture at Winnipeg.

**Polk**—Awned, bronze chaff variety of medium height, straw strength, and maturity. Resistant to stem and leaf rust. High yielding with excellent test weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Thatcher, Supreza, Frontana, Kenya 58, and Newthatch at the Minnesota Agricultural Experiment Station.

### VARIETIES NOT ADEQUATELY TESTED

**Neepawa**—Awnless, early variety of medium height and straw strength. Resistant to stem rust but moderately susceptible to leaf rust. High yielding with good test weight. Insufficient data on milling and baking characteristics. Selected from crosses involving Thatcher, Frontana, and Kenya Farmer by the Canada Department of Agriculture at Winnipeg.

**Waldron**—Awnless, yellow chaff variety of medium height. Matures early and has excellent straw strength. Resistant to stem and leaf rust. Seriously infected with ergot in 1969 in some research trials and seed fields. High yielding

with good test weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Lee, Mida, K338AA, and Justin at the North Dakota Agricultural Experiment Station.

**World Seeds 1812**—Awned, early semidwarf with good straw strength. Resistant to stem and leaf rust. High yielding with good test weight. Insufficient data on milling and baking characteristics. Parentage not disclosed. Released in 1969 by World Seeds Incorporated, Salinas, California.



Agronomist R.E. Heiner compares response of a Minnesota semidwarf experimental variety with Polk wheat under high nitrogen fertilization.

## OTHER VARIETIES

**Crim**—Awned variety of medium height, straw strength, and maturity. Susceptible to loose smut and leaf rust but resistant to stem rust. Good yield and test weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Klein, Titan, Thatcher, Kenya 58, and Newthatch at the Minnesota Agricultural Experiment Station.

**Fortuna**—Awnless, sawfly-resistant variety of medium height, straw strength, and maturity. Resistant to leaf and stem rust but very susceptible to black chaff. High yielding with good test weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Rescue, Chinook, Frontana, K58, and Newthatch at the North Dakota Agricultural Experiment Station.

**Justin**—Awnless, stiff-strawed, late variety. Susceptible to leaf rust but resistant to stem rust. Good yield and test weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Conley, Thatcher, Kenya Farmer, Mida, and Lee at the North Dakota Agricultural Experiment Station.

**Lathrop**—Awned variety of medium height and maturity with good straw strength. Moderately resistant to leaf rust and stem rust. High yielding with good test weight but poor quality. Selected from a cross of Henry and P.I. 94587 made at the Wisconsin Agricultural Experiment Station.

**Pembina**—Awnless variety of medium height, maturity, and straw strength. Good yield with medium test weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Thatcher, McMurachy, Exchange, and Redman by the Canada Department of Agriculture at Winnipeg.

**Red River 68**—Awned, semi-dwarf variety with good straw strength and maturity. Resistant to stem rust. High yielding with good test weight. Milling and baking characteristics are unsatisfactory. Parentage not disclosed. Released in 1967 by World Seeds Incorporated, Salinas, California.

**Selkirk**—Awnless variety of medium height and maturity with good straw strength. Susceptible to leaf rust but resistant to stem rust. Good yield with medium test weight. Milling and baking characteristics are satisfactory. Selected from crosses involving McMurachy, Exchange, and Redman by the Canada Department of Agriculture at Winnipeg, Manitoba.

**Sheridan**—Awned variety of medium height, maturity, and straw strength. Resistant to leaf and stem rust and loose smut. High yielding with good test weight. Baking characteristics are satisfactory but milling characteristics are not. Selected from crosses involving Frontana, K58, Newthatch, and Pilot at the Montana Agricultural Experiment Station.

Table 9. Yields and other characteristics of spring wheat varieties, 1967-69

Class and variety	Date of heading	Plant height, inches	Lodging score <sup>1</sup>	Leaf rust reaction <sup>2</sup>	Stem rust reaction <sup>2</sup>	Test weight pounds	Yield, bushels per acre				
							St. Paul	Waseca	Morris	Crookston	Average
<b>Hard Red Spring</b>											
Chris	June 28	39	3.7	R	R	62.8	40	40	37	41	40
Manitou	June 28	38	4.0	MS	R	61.0	41	40	37	42	40
Polk	June 28	39	3.8	R	R	62.2	37	37	35	40	37
Justin	June 29	38	2.8	S	R	60.9	35	32	34	35	34
Neepawa	June 27	39	3.5	MS	R	62.0	42	43	39	49	43
Waldron	June 27	38	2.0	R	R	62.3	38	40	38	45	41
LSD 5%							4	5	4	5	3
World Seeds 1812 <sup>3</sup>	June 26	30	2.5	R	R	62.1	39		33	45	
Red River 68 <sup>4</sup>	June 26	30	2.5	R	R	62.3	46	45	35	47	
<b>Durum</b>											
Wells	June 29	38	3.8	R	R	61.6	40		37	46	41
Lakota	June 29	39	4.0	MR	R	58.7	45		39	43	43
Leeds	June 28	38	3.0	R	R	62.3	36		36	42	38
Mindum	June 30	47	5.3	R-MR	R-S	61.5	35		33	38	35
Hercules	June 27	37	3.5	MS	R	59.6	41		38	42	40
LSD 5%							4		5	5	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> 1969

<sup>4</sup> 1968-69

## DURUM WHEAT

Durum production for the semolina market should be confined to the west-central and northwestern sections.

### RECOMMENDED VARIETIES

**Lakota**—Early, awned, short variety with medium straw strength. Resistant to stem and leaf rust, bunt, and loose smut. High yielding with medium test weight; quality is satisfactory for semolina products. Selected from crosses involving Sentry, Ld. 379, and Ld. 357 at the North Dakota Agricultural Experiment Station.

**Leeds**—Awned, early, short variety with good straw strength. Resistant to leaf and stem rust and loose smut. Very good test weight with large kernels. Quality is satisfactory for semolina products. Selected from crosses involving Brandon 180 and Wells at the North Dakota Agricultural Experiment Station.

**Wells**—Early, awned, short, stiff-strawed variety. Resistant to stem and leaf rust, bunt, and loose smut. High yielding with good test weight; quality is satisfactory for semolina products. Selected from crosses involving Sentry, Ld. 379, and Ld. 357 at the North Dakota Agricultural Experiment Station.

### VARIETIES NOT ADEQUATELY TESTED

**Hercules**—Awned, early, short variety with good straw strength. Resistant to stem rust, susceptible to some leaf rust isolates, susceptible to septoria. High yielding with satisfactory test weight. Macaroni quality superior to Mindum. Released in 1969 by the Canada Department of Agriculture at Winnipeg.

### OTHER VARIETIES

**Langdon**—Early, awned variety of medium height and straw strength. Moderately resistant to leaf rust, susceptible to stem rust, and resistant to bunt and loose smut. Medium yield and test weight; is satisfactory for use in making semolina

products. Selected from crosses involving Carleton, Ld. 194, Khapli, Ld. 308, and Stewart made at the North Dakota Agricultural Experiment Station.

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

**Stewart 63**—Awned, tall, late-maturing variety with weak straw. Resistant to leaf and stem rust. Good yield and test weight. Quality is satisfactory for semolina products. Selected from a backcross of Stewart and St 464 by the University of Saskatchewan.

## WINTER WHEAT

### RECOMMENDED VARIETIES

**Minter**—Tall, awned, winterhardy variety of medium straw strength. Susceptible to leaf rust and to some prevalent races of stem rust. High yielding with good test weight. Quality characteristics are satisfactory. Selected from a backcross of Hope and Minturki at the Minnesota Agricultural Experiment Station.

### OTHER VARIETIES

**Gaines**—Awned, semidwarf white wheat developed at the Washington Agricultural Experiment Station. Completely winterkilled in Minnesota trials.

**Hume**—Awned variety of medium height and straw strength. Susceptible to leaf rust and some prevalent races of stem rust. Test weight and quality characteristics are satisfactory. Not sufficiently winterhardy. Selected from a cross of unknown parentage at the South Dakota Agricultural Experiment Station.

**Lancer**—Awned variety of medium maturity and height with good straw strength. Susceptible to leaf rust and loose

smut, but resistant to some prevalent races of stem rust. Not sufficiently winterhardy. Selected from crosses involving Turkey, Cheyenne, and Hope at the Nebraska Agricultural Experiment Station.

**Warrior**—Early, awned, mid-tall variety with good straw strength. Winterhardiness is not satisfactory. Susceptible to leaf rust and stem rust. Low yield with medium test weight. Quality is satisfactory. Selected from a cross of Pawnee and Cheyenne at the Nebraska Agricultural Experiment Station.

**Winalta**—Awned variety of medium height and straw strength. Susceptible to leaf and stem rust. Test 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.

**Winoka**—Awned, winterhardy, variety of medium height, maturity and straw strength. Moderately resistant to stem rust and susceptible to leaf rust. Severe leaf necrosis in certain years. Milling and baking characteristics are satisfactory. Re-selection from Winalta by the South Dakota Agricultural Experiment Station.

Table 10. Yields and other characteristics of winter wheat varieties 1967-69

Variety	Date of heading	Plant height, inches	Winter injury percent	Lodging score <sup>1</sup>	Leaf rust reaction <sup>2</sup>	Stem rust reaction <sup>2</sup>	Test weight, pounds	Yield, bushels per acre		
								St. Paul	Waseca	Average
Minter	June 15	43	15	3.0	S	R-S	61.4	37	35	36
Warrior	June 13	39	25	3.5	S	S	58.8	34	25	30
Winalta	June 14	39	25	3.4	S	S	61.2	34	37	36
Winoka	June 13	39	15	3.2	S	R-S	61.2	31	34	33
LSD 5%								5	7	4

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

<sup>2</sup> Reaction to prevalent races: R = resistant, S = susceptible.

## 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

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

**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. Named in 1968 and released by the Colorado Agricultural Experiment Station. Originated by purifying seed of P.I. 222811 from Iran.



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

**Broomcorn or Yellow Hog**—Proso. Seedlots tested were later and lower yielding than Turghai. Medium-size yellow seed.

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

**Early Fortune**—Proso. Seedlots tested appeared to be uncultivated Turghai.

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

**Hungarian**—Foftail. Early. Short. Poor lodging resistance. Low yield. Small yellow, black, and brown seeds.

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

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

**Siberian**—Foftail. Similar to Manta except lower in yield.

**White Proso**—(A type, not a variety). Seedlots tested were later and sometimes lower yielding than Turghai. Large white seed frequently brings a premium price for parakeet feed.

Table 11. Yields and other characteristics of millet varieties sown in late June at Rosemount, 1967-69

Variety	Yield per acre		Forage protein <sup>1</sup> percent	Date heading	Height inches	Lodging <sup>2</sup>	Weight of 100 seeds grams	Bushel weight pounds
	Seed pounds	Forage <sup>1</sup>						
<b>Proso</b>								
Turghai	1992	2797	12.0	8-12	35	1.9	.56	53.7
Akron	1181	3903	-	9-1	37	3.3	.48	54.3
Leonard	1297	3981	-	8-30	35	2.3	.49	54.5
Panhandle <sup>3</sup>	1939	2101	-	8-15	36	3.9	.70	49.6
White	1998	2219	-	8-15	34	2.9	.70	49.9
<b>Foftail</b>								
Empire	1371	5822	9.0	8-27	45	3.3	.18	48.2
White Wonder	491	6328	8.4	9-6	48	1.2	.22	43.1
Golden German	1362	5931	8.6	8-31	41	2.6	.23	47.7
LSD 5%	290	679						

<sup>1</sup> oven-dry basis. <sup>2</sup> 1 erect, 9 flat. <sup>3</sup> 1968-69.

## 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 if planted during the recommended period of May 25 to June 10. The earliest hybrids are also satisfactory for some parts of central Minnesota.

Hybrids not tested in 1969, but which were of acceptable maturity for southern Minnesota in previous tests, include Nebraska 505, South Dakota 441, South Dakota 502, Northrup King 115, Northrup King 120, Northrup King 125, and Pawnee.

These trials were planted about June 1 in rows 30 inches apart for cultivation and also in noncultivated rows 12 inches apart. Sowing rate was 150,000 seeds per acre. Herbicides were used in all trials.



The lodging problem in mature grain sorghum is shown by the lodged variety in the center and resistant varieties on each side.

Table 12. Yields and other characteristics of grain sorghum hybrids at Lamberton, 1967-69

Hybrid and originator	Number of trials	Grain yield <sup>1</sup> per acre	Head moisture	Bushel weight	Height
		bushels	percent	pounds	inches
1, Minnesota	6	95	22	57.0	60
Minimilo 50A, Northrup King	6	77	23	56.5	48
133, Northrup King	6	97	28	57.1	49
A-25, DeKalb	6	100	30	53.7	49
LSD 5%		8	1		
3004, Northrup King	2	94	24	56.5	47
Grassy Grain I, Frontier	2	91	29	57.5	55
BL-101, Acco	4	96	30	56.3	57
R-920, Acco	5	94	30	56.6	52
GS 30, Weathermaster	4	91	32	55.9	58
102, South Dakota (variety)	2	60	33	54.8	47
445, Sokota	2	89	35	57.3	51
388A, Frontier	2	88	38	57.9	48
GX410, Frontier	2	78	40	53.6	43

<sup>1</sup> 13% moisture and 56 pound per bushel bases.

## FLAX

### RECOMMENDED VARIETIES

**Linott**—Released in 1967. Selected from crosses involving 770B, Arg. C, Arrow, and C.I. 974 by the Canada Department of Agriculture at Ottawa. High in yield, early maturing, good in oil content and iodine value. Resistant to race 300 of rust, moderately susceptible to wilt and pasmo.

**Nored**—Released in 1968 by the Minnesota Agricultural Experiment Station. Progeny of a plant line selected from an irradiated population of B-5128 x Redson. Good resistance to pasmo, wilt, and rust (*N<sup>1</sup>* gene); good resistance to lodging and more tolerant of the herbicides MCPA and dalapon than other commercial varieties; high oil content; late maturity; high seed yields especially when sown early.

**Norstar**—Released in 1969 by the Minnesota Agricultural Experiment Station from a cross of Redwood and Crystal. Resistance to *all* North American races of rust conditioned by *N<sup>1</sup>* gene, and to many races by the *L* gene. Resistant to wilt and lodging, moderately resistant to pasmo. High oil content of fair drying quality. Brown-seeded, blue-flowered, medium-late maturity, excellent seed yields, particularly when sown early.



Norstar, Minnesota's newest flax variety, and agronomist V.E. Comstock.

**Summit**—Released in 1964 by South Dakota Agricultural Experiment Station. Selected from a cross of B-5128 and Zenith. Immunity to rust conditioned by *N<sup>1</sup>* gene. Resistant to wilt and moderately susceptible to pasmo. Fair oil content of good drying quality. Brown-seeded, blue-flowered, early in maturity. Excellent seed yields.

**Windom**—Released in 1962 by Minnesota Agricultural Experiment Station from crosses involving Renew, Bison, Koto, Redwing, and Redwood. Immunity to rust conditioned by *N<sup>1</sup>* gene. Resistant to wilt and moderately susceptible to pasmo. Fair oil content of high drying quality. Brown-seeded, blue-flowered, early in maturity. Good seed yield, whether sown early or late.

### OTHER VARIETIES

**Army**—From a cross of Crystal and Redson made at Minnesota Agricultural Experiment Station. Highly resistant to wilt and moderately resistant to pasmo. Rust reaction conditioned by *L* gene, thus susceptible to race 300. Resistant to lodging. Fair oil content of good drying quality. Brown-seeded, blue-flowered, late-maturing.

**Bison**—Developed at North Dakota Agricultural Experiment Station by mass selection. Susceptible to rust, moderately susceptible to pasmo. Tends to lodge. Resistant to wilt. Low oil drying quality but good oil content. Brown seeds and blue flowers.

**Bolley**—Developed at North Dakota Agricultural Experiment Station from a cross of Birio and C.I. 1134. Immunity to rust conditioned by *N<sup>1</sup>* gene. Moderately susceptible to pasmo. Excellent oil content of excellent drying quality. Some evidence of greater susceptibility to aster yellow virus than other recommended varieties. Susceptible to damage by chlorosis. Brown-seeded, blue-flowered, medium-early maturing.

**B-5128**—From a cross of Golden and Rio made at North Dakota Agricultural Experiment Station. Immunity to rust conditioned by *N<sup>1</sup>* gene; moderately susceptible to both wilt and pasmo. Good oil content of only fair drying quality. Contains a mixture of types, including a small percentage of both yellow-seeded plants and rust-susceptible plants. Brown-seeded, blue-flowered, late-maturing. Yields are poor when sown late.

**Marine 62**—Selection of Marine made at Minnesota Agricultural Experiment Station. Released in 1962. Moderately resistant to wilt and pasmo. Rust reaction conditioned by *L* gene, thus susceptible to race 300. High oil content of high

drying quality. Brown-seeded, blue-flowered, early maturity. Yields are inferior to those of late-maturing varieties when sown early but superior in yield when sowings are made in late May or June.

**Noralta**—Selection from a cross of Rocket and Redwing made at Ft. Vermillion, Canada, and released in 1964. Moderately susceptible to wilt and pasmo. Resistant to race 300 of rust. Good in seed yield, very low in oil content, and fair in iodine value. Blue-flowered, brown-seeded, mid-late in maturity.

**Norland**—Selection from Victory made at North Dakota Agricultural Experiment Station; similar to Victory. Resistant to rust. Moderately susceptible to wilt. Susceptible to pasmo. Flowers are white with blue anthers, brown seeds. Late maturity.

**Raja**—Selection from a cross of experimental varieties by the Canada Department of Agriculture at Ottawa. Moderately

susceptible to wilt. Susceptible to pasmo. Resistant to rust, including race 300. Moderately short when sown early but relatively tall when sown late. While earlier than Windom it has not been as dependable in producing good yields. Large brown seeds, blue flowers. Low in both oil content and oil quality.

**Redwood**—Originated from a cross of B-5128 and Redson at Minnesota Agricultural Experiment Station. Has  $N^1$  gene which conditions immunity to rust. Moderately wilt resistant and moderately susceptible to pasmo. Good oil content of good drying quality. Straw of excellent fiber quality. Brown-seeded, blue-flowered, mid-late in maturity.

**Redwood-65**—Irradiated selection of Redwood developed in Canada and released in 1964. Similar to Redwood in maturity and appearance, superior to Redwood in seed yield and oil content. This selection is more susceptible to pasmo than Redwood.

Table 13. Yield of flax varieties in pounds per acre, 1967-69

Variety	Early-sown				Late-sown				Average
	Lamberton	Morris	Crookston	Average	Lamberton	Morris	Crookston	Average	
No. trials	1	3	2	6	2	3	2	7	13
Linott	1861	1386	799	1270	975	1007	692	908	1075
Nored	1705	1479	844	1305	706	1065	520	807	1037
Norstar	1855	1454	718	1276	781	979	774	864	1054
Summit	1637	1307	770	1183	987	1011	716	920	1041
Windom	1763	1355	688	1201	844	1055	692	891	1034
Bolley	1372	1302	558	1066	890	956	534	817	932
B-5128	1585	1407	732	1212	577	953	682	768	973
Foster	1338	1361	638	1116	686	937	496	739	913

Table 14. Characteristics of flax varieties, 1967-69

Variety	Days from sowing to		Plant height inches	Weight of 1000 seeds (grams)	Lodging <sup>1</sup>	Pasm <sup>1</sup>	Wilt <sup>1</sup>	Major <sup>2</sup> rust genes	Oil <sup>3</sup> content %	Iodine value no.
	First bloom	Full bloom								
No. trials	17	17	17	8	7	6	7		25	25
Linott	53	60	23	5.0	5	4	5	L <sup>6</sup>	41.0	181
Nored	56	64	25	5.8	3	3	3	N <sup>1</sup>	40.7	185
Norstar	56	63	24	5.6	4	4	3	LN <sup>1</sup>	40.2	180
Summit	54	61	23	5.6	4	5	3	N <sup>1</sup>	39.2	183
Windom	53	61	22	5.3	4	5	2	N <sup>1</sup>	39.7	185
Bolley	53	61	23	5.7	3	4	4	N <sup>1</sup>	41.8	187
B-5128	56	65	25	6.1	5	4	5	N <sup>1</sup>	39.9	179
Foster	56	64	24	5.2	5	3	4	?	42.6	179

<sup>1</sup> 1 = best, 9 = poorest; data were obtained from trials in north central flax growing area.

<sup>2</sup> All varieties immune to North American races of rust.

<sup>3</sup> 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 15 for Rosemount, St. Paul, Crookston, Moorhead, Morris, Lamberton, and Waseca are from replicated, combine-harvested plots. The data for Grand Rapids, southern Minnesota, and the sandy soil area northwest of the Twin Cities are from replicated, multiple-row nursery plots.

The varieties are grouped into three maturity categories. Certain transitional varieties appear in more than one maturity grouping. Comparisons should be made within groupings only, since varying numbers of years or locations of plots may be involved between groupings.

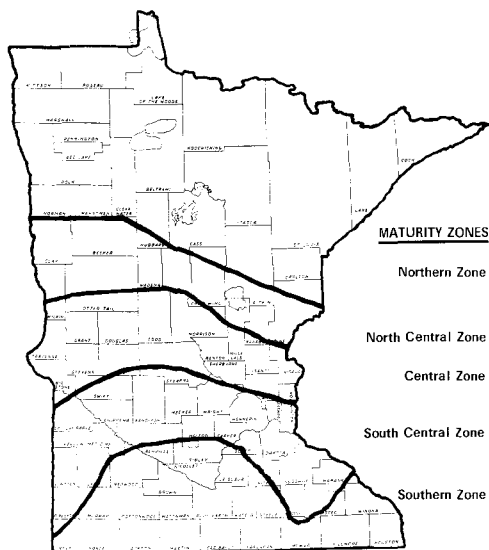
Data on maturity, standability, plant height, seed size, and seed quality, in Table 16, are from locations suited to par-

ticular 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 are three-year averages obtained from plantings on a soil area near Lamberton which has free lime and a very high pH. No protein and oil determinations are available which correspond directly with yield tests reported. Hence, data on these characteristics in Table 16 were obtained from other tests.

### RECOMMENDED VARIETIES

**Altona**—Developed at the University of Manitoba from a cross of P.I. 194654 and Flambeau. Recommended for northern and north central zones.

**Anoka**—Developed at the Minnesota Agricultural Experiment Station from a cross of II-42-37 and Korean. II-42-37 is an unnamed selection from crosses involving Lincoln and



Richland. Recommended for the south central and southern zones and the southern half of the central zone. It has performed well on sandy soils, but is not suited to high-lime soils.

**Chippewa 64**—Developed at the USDA Regional Soybean Laboratory from Chippewa by backcrossing. Similar in all respects, except Phytophthora resistance, to Chippewa which was selected from crosses involving Lincoln and Richland at the Regional Laboratory. Recommended for south central and southern zones and southern one-third of central zone.

**Clay**—Developed at the Minnesota Agricultural Experiment Station from a cross of Renville and Capital. Recommended for the north central, central, and northern zones.

**Corsoy**—Developed at the Iowa Agricultural Experiment Station from a cross of Harosoy and Capital. Recommended for southern zone only.

**Hark**—Developed at the Iowa Agricultural Experiment Station from a cross of Hawkeye and Harosoy. Recommended for the southern zone. Should not be grown on high lime soils.

**Merit**—Developed by the Canada Department of Agriculture at Ottawa from a cross of Blackhawk and Capital. Recommended for central and north central zones.

**Norman**—Developed at the Minnesota Agricultural Experiment Station from a cross of Acme and Hardome. Recommended for the northern and north-central zones.

**Portage**—Developed at the University of Manitoba from a cross of Acme and Comet. Recommended for the northern zone.

**Rampage**—Developed at the Iowa Agricultural Experiment Station from a cross of Clark and Chippewa. Recommended for the southern and south central zones.

**Traverse**—Developed at the Minnesota Agricultural Experiment Station from a cross of Lincoln and Ottawa Mandarin. Recommended for south central, central, and southern zones.

#### VARIETIES NOT ADEQUATELY TESTED

**Wirth**—Developed at the Iowa Agricultural Experiment Station from a cross of Clark and Chippewa. Very similar to Chippewa 64 in maturity, height, protein and oil content, and in general appearance but lacks the Phytophthora resistance of Chippewa 64.

#### OTHER VARIETIES

**A-100**—Developed by Anderson Brothers, St. Peter, Minnesota. Similar in maturity and standing ability to Hark but yields appreciably less.

**Acme**—A very early selection from the variety Pagoda, developed in Canada. Similar in most respects to Portage but somewhat inferior to it in yield.

**Amsoy**—Selected at the Iowa Agricultural Experiment Station from a cross of Adams and Harosoy. Several days later than Corsoy and usually yields less in Minnesota.

**Beeson**—Developed at the Indiana Agricultural Experiment Station from a cross of C1253 and Kent. About the same maturity and yielding ability as Amsoy. Resistant to Phytophthora root rot.

**Blackhawk**—Selected at the Iowa Agricultural Experiment Station from a cross of Mukden and Richland. Medium tall.

Table 15. Average yield of soybean varieties in bushels per acre

Variety <sup>1</sup>	Crookston 1967- 69	Grand Rapids 1968- 69	Moorhead		Morris 1967- 69	Sandy <sup>2</sup> land 1966-67 & 69	St. Paul- Rosemount <sup>3</sup> 1967- 69	Waseca			Lamberton			Southern <sup>4</sup> Minnesota	
			1967- 69	1968- 69				Normal planting date 1964- 69	Early planting date 1968- 69	Normal planting date 1964- 69	Early planting date 1968- 69	1964- 69	1968- 69		
														1964- 69	1968- 69
<b>Early maturing group</b>															
Portage	15	31	22		21										
Norman	18	33	22		23										
Altona	17	33	24		24										
Clay	21	33	28		28										
Merit	19	24			26										
<b>Medium maturing group</b>															
Clay				26	26	23	33								
Merit				26	24	24	32	35	34			27	34		31 35
Traverse				24	24	24	29	36	36			27	33		33 37
Grant				26	23	25	28	38	35			26	30		34 38
Chippewa 64					25	24	28	38	39			29	35		34 42
Anoka						30		41	41			30	36		42
<b>Late maturing group</b>															
Chippewa 64								38	36	35	27	32	36	33	37
Rampage										41			37		44
Hark								40	39	42	29	34	42	41	49
A-100								36	33			26	26		34 39
Corsoy								42	41	42		32	38	40	39 50
Amsoy								39	40	42		30	35	40	38 48

<sup>1</sup> Ranked according to maturity adaptation from north to south.

<sup>2</sup> Represents several irrigated sandy fields: Near Big Lake 1966-67, near Clear Lake 1969.

<sup>3</sup> Rosemount 1967-68, St. Paul, 1969.

<sup>4</sup> Blue Earth 1964-67, Fairmont, 1968-69.



Pathologist B.W. Kennedy and agronomist J.W. Lambert discuss disease symptoms on a soybean plant.

About 5 to 6 days later in maturity than Chippewa yet averages somewhat lower in yield and has less resistance to lodging.

**Bombay**—Selected by Illinois farmer. Similar to Hark in maturity but yields less and lodges much more. Highly susceptible to chlorosis on high-lime soils.

**Capital**—Selected by the Canada Department of Agriculture at Ottawa from a cross of 171 and A.K. (Harrow). Similar to Grant in maturity and yield, but lodges more and has lower oil content.

**Chippewa**—Similar in all respects to Chippewa 64 except that it is susceptible to Phytophthora root rot.

**Comet**—A selection made by Canada Department of Agriculture at Ottawa from a cross of Pagoda and Mandarin. Similar to Merit in maturity, but lower in yield. Highly susceptible to chlorosis injury on high-lime soils.

**Disoy**—A variety with very large yellow seeds well suited for edible uses either as a garden vegetable or in the specialized Oriental food market. Yields less than recommended varieties of this maturity and presents special problems in planting and harvesting. Developed at the Iowa Agricultural Experiment Station from crosses involving Ottawa Mandarin,

Kanro, Richland, and Jogun. Five or six days later than Chippewa 64.

**Flambeau**—An early variety selected at the Wisconsin Agricultural Station from an introduction from Russia. Yields less and lodges more than Clay.

**Ford**—Selected at Iowa Agricultural Experiment Station from crosses involving Lincoln and Richland. Two or three weeks later than Chippewa. Too late for most of Minnesota. Earlier varieties yield as well or better.

**Grant**—Developed at the Wisconsin Agricultural Experiment Station from a cross of Lincoln and Seneca. Similar to or somewhat lower in yield than Chippewa 64. Tends to lodge more and is susceptible to Phytophthora root rot.

**Harosoy**—Selected at the Canada Experimental Farm, Harrow, Ontario, from crosses involving Mandarin and A.K. Similar to Corsoy in maturity, height, and standing ability but yields appreciably less.

**Harosoy 63**—Similar to Harosoy except that it is resistant to Phytophthora root rot.

**Hawkeye**—Selected at Iowa Agricultural Experiment Station from a cross of Mukden and Richland. Ten days to 2 weeks later than Chippewa. Very late for Minnesota. Earlier varieties yield as well or better.

**Hawkeye 63**—Similar to Hawkeye in all respects except for its resistance to Phytophthora root rot.

**Lindarin**—Selected at the Indiana Agricultural Experiment Station from a cross of Ottawa Mandarin and Lincoln. Similar to Corsoy in maturity and has yielded significantly less.

**Lindarin 63**—Similar to Lindarin except for resistance to Phytophthora root rot.

**Magna and Prize**—Large seeded varieties developed at the Iowa Agricultural Experiment Station from the same parentage as Disoy. Several days later in maturity than Disoy.

**Ottawa Mandarin**—Selected by the Canada Department of Agriculture at Ottawa from the variety Mandarin. Medium early and fairly short. Highly resistant to lodging. Large, solid-yellow seeds.

Table 16. Characteristics of soybean varieties

Variety	Mature	Stand-ability <sup>1</sup>	Plant height inches	Seed size gms/100 beans	Seed quality score <sup>1</sup>	Protein rating <sup>2</sup>	Oil rating <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>
Early maturing group (average of Crookston and Morris, 1967-69)												
Portage	9-05	1.0	20	14.8	3.1	M	M	S	3.1	P	G	Y
Norman	9-08	1.1	22	14.8	3.0	M	M	S	1.9	P	G	Y
Altona	9-09	1.2	22	16.5	3.1	M	M	R	3.2	P	T	Bl
Clay	9-15	1.3	22	14.1	2.9	M	H	S	2.3	P	G	Y
Merit	9-21	1.1	26	12.4	3.0	M	M	R	2.5	W	G	Bf
Medium maturing group (average of St. Paul-Rosemount and Morris, 1968-69)												
Clay	9-09	1.5	27	14.4	2.5	M	H	S	2.3	P	G	Y
Merit	9-14	2.1	33	12.6	2.4	M	M	R	2.5	W	G	Bf
Traverse	9-15	2.2	30	14.2	2.6	M	M	S	4.0	W	G	Y
Grant	9-18	2.2	30	13.4	2.6	M	M	S	3.5	W	T	Bl
Chippewa 64	9-21	2.4	34	13.2	2.7	M	M	R	2.0	P	T	Bl
Anoka	9-22	2.4	32	16.6	2.5	M	H	S	4.7	P	T	Bl
Late maturing group (average of Waseca and Lambertson, early May planting 1968-69)												
Chippewa 64	9-17	1.6	36	15.6	2.5	M	M	R	2.0	P	T	Bl
Rampage	9-24	2.0	37	17.6	2.2	M	M	S	3.1	P	T	Bl
Hark	9-26	2.6	40	17.0	2.2	M	M	S	4.2	P	G	Y
A-100	9-26	2.4	37	17.8	2.3	M	H	S	2.9	W	G	Bf
Corsoy	9-25	3.0	40	15.8	2.4	M	M	S	3.2	P	G	Y
Amsoy	10-01	2.6	43	17.6	2.2	M	H	S	3.0	P	G	Y

<sup>1</sup> 1 — excellent, 5 — very poor; Chlorosis scores average of 3 years in "high-lime" nursery at Lambertson.

<sup>2</sup> Protein and oil information from tests other than yield tests reported; H = high, M = medium.

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

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

## 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. Stands well for combining but tends to shatter when dry. Seed is striped, medium in size, medium in hull, low in oil, high in protein, and high in bushel weight. Good seedling vigor. Excellent for birdfeed production. An open-pollinated variety released in 1954 by the Minnesota Agricultural Experiment Station.

**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 feeding loss than other recommended varieties. Large seed used for dehulled and whole seed food uses and the smaller seed for birdfeed. An open-pollinated variety selected from Mennonite by the Minnesota Agricultural Experiment Station. Released in 1964.

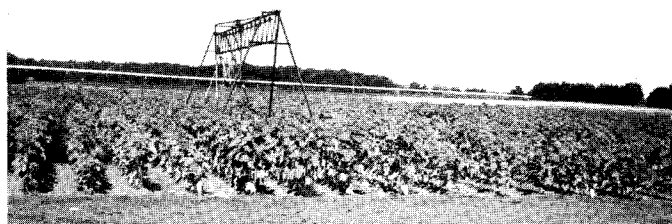
**Peredovik**—Medium to high yield. Late and tall. Small black seed of high bushel weight and low hull and very high oil percentages. Excellent for the oilseed market but not for the birdfeed or whole seed food markets. An open-pollinated variety developed in Russia. **Peredovik 66** is less uniform, later, taller, and slightly higher in oil.

**VNIIMK 89.31**—Medium to high yield. Late and tall. Small black seed of high 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. An open-pollinated variety developed in Russia. **VNIIMK 89.31 66** is less uniform, later, taller, and slightly higher in oil.

### VARIETIES NOT ADEQUATELY TESTED

**D-672**—High yield. Late and tall. Seed is striped, medium in size and bushel weight, and low in oil. Rust-resistant topcross hybrid produced by Dahlgren and Company, Inc., by alternating CM90RR inbred with Mingren in blocks of various numbers of rows each. Seed harvested from CM90RR rows is used for hybrid seed.

**Majak**—Medium yield. Late and tall. Small black seed of high bushel weight and low hull and very high oil percentages. An open-pollinated variety developed in Russia.



Four sunflower varieties being irrigated with an experimental plot irrigator at the Sand Plain Experimental Field near Elk River.

**Record**—Medium yield. Late and tall. Lodging medium. Small black seed of high bushel weight and low hull and very high oil percentages. Seed came from Romania.

**Select**—Medium to high yield. Late and tall. Small black seed of high bushel weight and low hull and very high oil percentages. Seed came from Romania.

**Smyrna**—Medium yield. Late and tall. Small black seed of high bushel weight and low hull and high oil percentages. Seed came from Bulgaria.

**TAM-CRD P-21 ms x TAM-CRD HA60**—High yield. Late and tall. Small striped seed of high bushel weight and low hull and high oil percentages. Rust-resistant hybrid whose parental lines were released by the Texas Agricultural Experiment Station-USDA in 1968. Produced by alternating the parents in blocks of various numbers of rows each. About 50% of the P-21 ms plants are male fertile, and these must be killed at the onset of pollination. The remaining P-21 ms plants are harvested for hybrid seed.

**Valley**—High yield. Late and tall. Small striped seed of high bushel weight and low hull and high oil percentages. Rust-resistant topcross hybrid licensed in 1968 by Canada Department of Agriculture. Produced by alternating two rows of CM90RR inbred with four rows of Peredovik. Seed harvested from the CM90RR rows is used for Valley seed.

Table 17. Yields of sunflower varieties at Rosemount and Crookston 1965-69 and Grand Rapids 1967-69

Variety	Yield per acre, pounds			
	Rosemount	Crookston	Grand Rapids	Average of 3 locations
Arrowhead	1775	1591	2036	1801
Mingren	1781	1879	1897	1852
Peredovik	1705	1762	1821	1763
VNIIMK 89.31	1723	1901	1890	1838
Armavirec	1644	1323	1439	1469
LSD 5%	190	249	269	138
Krasnodarets <sup>1</sup>	1446	848	1529	1274
P-21 ms x HA60 <sup>2</sup>	2181	2167	1973	2107
Valley <sup>3</sup>	2064	2570	1987	2207
Smyrna <sup>4</sup>	1882	1632	1522	1679
Peredovik 66 <sup>3</sup>	1751	1949	—	1886
VNIIMK 89.31 66 <sup>3</sup>	1820	1885	—	1889
Majak <sup>5</sup>	1623	1385	1621	1543
Record <sup>5</sup>	1376	2092	1647	1705
Select <sup>5</sup>	1554	2347	1519	1807
D-672 <sup>5</sup>	1752	2636	—	2330

<sup>1</sup> 1967-69 Rosemount, Grand Rapids. 1968-69 Crookston. <sup>2</sup> 1967-69. <sup>3</sup> 1968-69.

<sup>4</sup> 1968-69 Rosemount, Crookston. 1969 Grand Rapids. <sup>5</sup> 1969.

## OTHER VARIETIES

**Armavirec**—Medium to low yield. Very early and short. Small black seed of high bushel weight, low hull and medium oil percentages. Is better than Peredovik or VNIIMK 89.31 for June planting. An open-pollinated variety developed in Russia.

**Commander**—Medium yield. Similar to Mingren in maturity, height, and use. Smaller and darker seed than Mingren. An open-pollinated variety 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.

**Krasnodarets**—Medium to low yield. Very early and short. Small black seed of high bushel weight and low hull and

medium oil percentages. An open-pollinated variety developed in Russia.

**Mennonite**—Medium yield. Similar to Mingren in maturity, height, and use. Smaller and less uniform seed than Mingren. Originated in Russia.

**Smena**—Medium yield. Late maturity and medium height. Small black seed of high bushel weight and low hull and very high oil percentages. An open-pollinated variety developed in Russia.

### Disease Reaction Of Presently-Grown Varieties

All varieties except D-672, Valley, and P-21 ms x HA 60 are susceptible to rust. Peredovik, VNIIMK 89.31, and some other high-oil varieties have some tolerance to rust and considerable tolerance to leaf mottle (caused by Verticillium). All varieties are susceptible to downy mildew and to stem rot (caused by Sclerotinia).

Table 18. Characteristics of sunflower varieties

Variety	Date of flowering	Plant height	Lodging <sup>1</sup>	Seed			
				Weight of 100	Large seed <sup>2</sup>	Bushel weight	Oil <sup>3</sup>
		inches		grams	percent	pounds	percent
Arrowhead	7-27	60	2.1	8.6	3	29.2	30.7
Mingren	8-1	62	2.4	11.6	59	22.9	26.8
Peredovik	8-2	65	2.4	6.1	0	28.7	44.7
VNIIMK 89.31	8-3	67	2.7	6.1	0	28.8	45.1
Armavirec	7-25	54	1.9	7.2	0	29.9	42.9
Krasnodarets	7-26	56	2.1	6.8	0	29.3	42.4
P-21 ms x HA60	8-1	65	2.5	6.3	0	29.9	40.6
Valley	8-3	66	2.7	7.4	1	30.5	40.1
Smyrna	8-3	68	2.4	6.3	0	29.1	43.2
Peredovik 66	8-3	71	2.1	6.3	0	28.4	45.7
VNIIMK 89.31 66	8-5	72	2.6	6.2	0	28.7	45.5
Majak	8-4	70	2.6	6.3	0	30.9	47.0
Record	8-5	73	3.7	5.6	0	29.2	46.2
Select	8-5	72	2.4	6.4	0	29.3	46.2
D-672	8-2	65	2.5	8.8	8	27.0	33.9

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

<sup>2</sup> Held on 20/64 round-hole screen.

<sup>3</sup> Oven-dry basis.

## 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 are usually sown in a mixture with oats. See Minnesota Extension Bulletin 300 for more information.

### RECOMMENDED VARIETIES

**Century**—Medium to early maturity. Long vined. Large, cream-colored seed of high bushel weight. Good cooking quality. Licensed in 1960 by Canada Department of Agriculture from crosses involving Chancellor, Early Raymond, and Stirling. Grow for soup market.

**Chancellor**—Medium maturity. Long vined. Small, cream-colored seed of high bushel weight. Selected at the Experi-

mental Station, Ottawa, Canada, in 1906 from an English variety also called Chancellor. Grow for forage, feed grain, and pigeon feed market.

### OTHER VARIETIES

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

**Strål**—Medium maturity. Long vined. Cream-colored seed, medium in size, and high in bushel weight. Good cooking quality. Originated at the Weibullsholm Plant Breeding Institute, Landskrona, Sweden, as an X-ray mutation from Kloster.

Table 19. Yields and other characteristics of pea varieties at Crookston, 1965-68

Variety	Seed yield	Weight of	Seed	Date	Vine	Sowing rate
	per acre	100 seeds	protein <sup>1</sup>	first bloom	length	per acre
	pounds	grams	percent	June	inches	pounds
Century	1907	21.4	25.5	26	53	225
Chancellor	1483	13.2	26.5	28	42	122
Strål	1520	15.4	27.8	26	45	143
LSD 5%	465					

<sup>1</sup> Dry matter basis.

## ALFALFA

Present alfalfa varieties, released by both private and public plant breeders, represent a continuous range in winterhardiness, fall dormancy, recovery after harvest, bacterial wilt resistance, and yield. Therefore, realistic classifications of "satisfactory" and "unsatisfactory" varieties can not be made. Variety descriptions and performance data are given to provide a basis for alfalfa growers to select varieties which suit their needs. When selecting a variety, study the data available and consider the factors indicated in light of your needs.

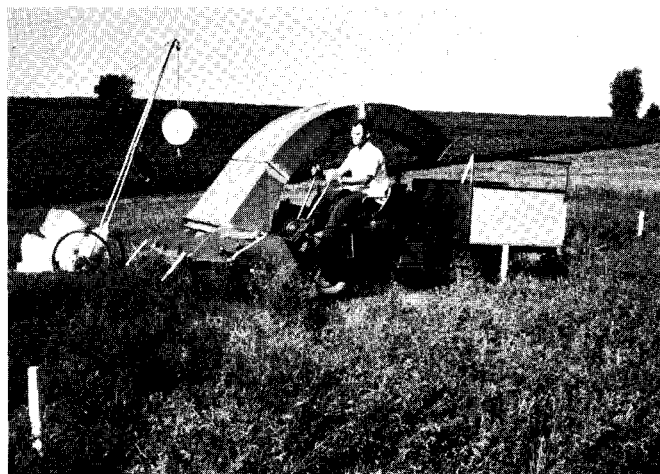
The following characteristics are important:

**WINTERHARDINESS**—Severe winters in Minnesota 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 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 winterkilling. Stand reductions after winter are often due to a combination of wilt damage and winter injury.

**OTHER DISEASES**—Common leafspot, blackstem, and *Pseudoplea* leafspot are other diseases of some importance in Minnesota. Losses from these diseases are more difficult to observe and do not normally destroy stands as does bacterial wilt. Resistance to these diseases is a consideration in selecting varieties, but is secondary to bacterial wilt resistance and winterhardiness.

**FORAGE YIELD**—The ultimate value of a variety depends upon total forage yield. Most varieties will yield



Agronomist D.M. Smith harvests alfalfa plots with an experimental forage harvester-chopper.

well, but some are consistently high yielders. All varieties have an inherent yield potential which is largely influenced by inherited characteristics; for example, winterhardiness, disease resistance, and insect resistance. Environment (including soil fertility, climate, and management) also influences yield. Top yields are only obtained when all these factors are favorably combined.

The Minnesota Agricultural Experiment Station recommends the use of certified seed. Purchase of certified seed provides the best assurance of obtaining varietal purity. Numerous tests have shown that uncertified seed generally performs less consistently than certified seed. For consistent performance from year to year, insist on certified seed. A "blend" is not necessarily composed of the same sources each year. Therefore, the performance of a blend may vary from year to year. Some seed is sold on basis of area where grown (i.e., Kansas common). Seed of this type is not a variety and varies from lot to lot.

### CLASSIFICATION OF ALFALFA VARIETIES

Alfalfa varieties are grouped according to winterhardiness and bacterial wilt reaction. In some cases very limited data are available and classifications may be revised when more complete information is obtained.

Table 20. Forage yields of very hardy varieties expressed as percent of Ranger and Vernal at Rosemount

Variety	Forage yield
Beaver	94
Norseman	95
Teton	91
Travois	85
Ranger	96
Vernal	104
LSD 5%	8
Average of Ranger and Vernal in tons per acre	4.55

Table 21. Forage yields of moderately hardy, bacterial wilt susceptible alfalfa varieties at Rosemount expressed as percent of Ranger and Vernal

	Seeded in 1965			Seeded in 1966	
	1966	1967	1968	1967	1968
Alfa	121	100	3	107	87
Cardinal	105	98	3	103	82
DuPuits	112	95	4	100	90
Europa	114	100	3	104	85
F D 100	113	98	8	103	84
Flandria	104	97	2	95	86
Glacier	109	100	10	102	100
Orchies	111	104	3	102	75
Ranger	96	98	82	99	102
S C 118	109	99	3		
Vernal	104	101	118	101	98
W L 302	110	100	14	103	93
Average yield of Ranger and Vernal (tons/acre)	5.05	5.06	3.33	5.01	4.41



### 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.

The varieties are Beaver, Norseman, Teton, and Travois.

### 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 to high resistance in Vernal. Forage yields vary between varieties but are adequate for economic production.

Varieties in this group are Cayuga, Culver, Dawson, DeKalb 123, Iroquois, Ladak, Ladak 65, Progress, Ranger, Rambler, Scout, Titan, Uinta, Vernal, WL202, 522, and 525.

Table 22. Forage yields expressed as percent of the average of Vernal and Ranger and bacterial wilt reaction of alfalfa varieties

	Crookston (1967-68)	Grand Rapids (1968-69)	Lamberton (1968-69)	Morris (1968-69) <sup>2</sup>	Rosemount (1968-69)	Waseca (1966-67)	Bacterial wilt <sup>1</sup>
<b>Moderately hardy varieties<sup>4</sup></b>							
Alfa	92	118	100	95	104	98	S
Apex	104	112	102	100	110	104	S
Cardinal	93	109	100	96	101	97	S
DuPuits	95	110	100	96	99	99	S
Europa	96	115	95	102	104	99	S
FD 100	105	115	97	103	102	101	S
Flandria <sup>5</sup>	99	117	96	104	95	98	S
Glacier	112	115	95	98	104	103	S
Haymore	91	112	104	100	116	102	MR
Orchies	101	106	98	102	97	97	S
PAT 30	98	111	100	101	97	91	S
Ranger	98	102	98	94	98	96	R
Saranac	99	117	104	107	103	105	VR
SC 118	92	111	95	92	108	103	S
Socheville	99	111	95	97	102	103	S
Stride	107	109	94	89	102	91	S
Vernal	103	98	102	107	101	104	VR
Warrior	99	104	100	105	98	98	MR
WL 302	92	104	99	92	112	95	S
WL 303	103	114	101	98	98	100	MR
Average of checks in tons per acre	3.94	4.31	5.05	4.31	4.18	4.23	
<b>Hardy varieties<sup>4</sup></b>							
A-59	98	101	103	—	103	107	R
Altfranken-Schmidt	117	—	—	—	97	94	S
Arnim	102	102	100	107	103	99	S
Beaver	104	—	—	104	—	99	R
Cayuga	108	—	—	104	—	102	R
Dawson	—	—	102	—	98	99	R
Franck's Langmeiler	105	107	103	—	100	99	S
Iroquois	98	107	107	—	105	110	VR
Mark II	102	103	109	114	102	99	R
Narragansett	107	104	101	102	100	105	S
Norseman	111	102	—	97	—	95	R
Progress	98	98	101	99	100	102	R
Ranger	97	97	98	95	95	100	R
Saranac	109 <sup>3</sup>	108	106	90 <sup>3</sup>	105	114 <sup>3</sup>	VR
Scout	97 <sup>3</sup>	103	100	92	100	104 <sup>3</sup>	MR
Titan	—	—	—	—	—	—	VR
Vernal	102	103	101	105	104	100	VR
WL 202	103	106	105	107	110	100	R
522	106	100	105	93	100	96	R
525	106	98	106	108	103	99	R
Average of checks in tons per acre	3.28	4.54	4.94	3.14	4.12	4.06	

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

<sup>2</sup> Hardy variety data based on 1967 yields + first cut of 1968.

<sup>3</sup> One year data only. Should be recognized as less reliable than longer term data.

<sup>4</sup> Varieties were classified into trials according to available information. The same check varieties were used in each trial. Therefore, check yields are not necessarily the same for each group.

<sup>5</sup> Land races of Flemish type used as variety designation in this country.

### 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.

Varieties in this group are Altfranken-Schmidt, Atlantic, Franck's Langmeiler, Grimm, and Narragansett.

### Moderately hardy, 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 they will respond like the winterhardy, wilt-resistant group, but severe winter conditions will reduce stands and yields. Varieties in this group are: Buffalo, Cody, Haymore, Lahontan, Saranac, Warrior, and W.L.303.

### Moderately hardy, wilt-susceptible varieties

This group is generally characterized by rapid recovery after harvest, late dormancy, less winterhardiness, and more fall growth than the winterhardy wilt-resistant group. Most varieties in this group are Flemish varieties introduced from Europe and are completely susceptible to bacterial wilt. When winter injury and wilt are not 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 of the moderately hardy, bacterial wilt susceptible varieties in Minnesota. The data were collected in 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.

Varieties in this group are: Alfa, Apex, Arnim, Cardinal, Cherokee, DeKalb 153, DuPuits, Europa, F.D. 100, Flandria, Glacier, Milfeuil, Orchies, PAT-30, S.C. 118, Socheville, Stride, and W.L. 302.

### 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, Hairy Peruvian, Moapa, and Sonora.

## BIRDSFOOT TREFOIL

### RECOMMENDED VARIETIES

**Empire**—Selected at the New York Agricultural Experiment Station. Winterhardy, prostrate growth, good yield.

### VARIETIES NOT ADEQUATELY TESTED

**Leo**—Bred at MacDonal College, Quebec, Canada. Outstanding seedling vigor and high forage yield.

**Viking**—Selected at the New York Agricultural Experi-

ment Station. A little less winterhardy than Empire. Relatively upright growth. Good yield.

Table 23. Yield of birdsfoot trefoil in tons per acre, 1968-69

	Crookston	Grand Rapids	Lamberton	Rosemount
Empire	3.50	2.31	2.38	3.74
Viking	3.06	2.67	1.53	2.72
Leo	3.55	3.04	3.40	4.13

## RED CLOVER

### RECOMMENDED VARIETIES

**Dollard**—Selected at MacDonal College, Quebec, Canada. Resistant to several strains of northern anthracnose and viruses. Good forage and seed yield and better stand persistence into second crop year than varieties not recommended. Susceptible to powdery mildew.

**Lakeland**—Bred by the Wisconsin Agricultural Experiment Station in cooperation with the U.S. Department of Agriculture. Released in 1959. Resistant to several strains of northern anthracnose and virus. Highly resistant to powdery mildew. Good forage and seed yield and relatively good

persistence into second crop year. When northern anthracnose and virus are severe the superiority of the recommended varieties is evident.

### OTHER VARIETIES

**Kenland**—Developed by the Kentucky Agricultural Experiment Station and the U.S. Department of Agriculture. Very susceptible to northern anthracnose and virus.

**Pennscott**—A naturalized variety from the farm of Frank Scott, Lancaster, Pennsylvania. Very susceptible to northern anthracnose and virus.

## SWEETCLOVER

### RECOMMENDED VARIETIES

**Evergreen**—A white-blossomed, biennial sweetclover introduced from Ohio. It produces a larger growth than common types. It has a longer grazing season because of later maturity.

**Goldtop**—A yellow-blossom biennial type bred at the Wisconsin Agricultural Experiment Station in cooperation with the U.S. Department of Agriculture. Outstanding for seedling vigor. Resistant to leaf and stem diseases. Good forage yield both seedling year and second year. A few days earlier than Evergreen, but much later than Madrid.

**Madrid**—A yellow-blossomed, biennial type introduced into United States from Madrid, Spain, in 1910. The first-year

growth of Madrid is superior to common types and the forage and seed production the second year are satisfactory. Time of flowering is similar to common types.

### VARIETIES NOT ADEQUATELY TESTED

**Cumino**—A white-blossomed biennial bred at Saskatoon and licensed in Canada in 1957. The result of 10 years of breeding work involving interspecific crosses with particular attention paid to low coumarin content. Gave consistently poor stands at five stations in 1961.

**Denta**—A white flowered, low-coumarin synthetic bred by the Wisconsin Agricultural Experiment Station in cooperation with the U.S. Department of Agriculture. Has looked promising in 2 years of tests, but not as vigorous as Goldtop.

## BROMEGRASS

### RECOMMENDED VARIETIES

**Achenbach**—A naturalized southern strain from the farm of Achenbach brothers in Washington County, Kansas. Improved by mass selection and introduced by the Kansas Agricultural Experiment Station. In regional tests the highest forage yield in the northern part of the north central region.

**Fischer**—Seed collection from old brome field on the E. A. Fischer farm, Shenandoah, Iowa. Increased and tested by the Agricultural Experiment Station in cooperation with the Soil Conservation Service at Ames, Iowa. Vigorous southern type.

**Fox**—A new variety bred at the Minnesota Experiment Station. Equal to other recommended varieties in yield and superior for seedling vigor and leaf spot resistance. Southern type.

**Lincoln**—Increased at the Nebraska Agricultural Experiment Station from collections from old brome fields. Good forage yield. Southern type. Seed plentiful in Minnesota.

### VARIETIES NOT ADEQUATELY TESTED

**Blair and Baylor**—Southern type varieties introduced by W. R. Grace & Company.

**Sac**—Selected at the Wisconsin Agricultural Experiment Station in cooperation with the Agricultural Research Service. A southern type brome, it possesses superior tolerance to leaf spot.

**Saratoga**—Selected at the New York Agricultural Experiment Station from a wide collection of seedlots obtained from plant breeders in the United States. Synthetic variety of five clones. Equal to Lincoln in yield in New York.

Table 24. Yields of brome grass varieties in tons per acre, 1965-68

	Rosemount	Lamberton	Crookston	Grand Rapids
Fox	3.99	4.17	2.91	4.37
Sac	4.11	4.20	2.92	4.18
Saratoga	3.76	4.25	2.87	4.46
Achenbach	4.18	4.38	2.92	4.28
Lincoln	3.94	3.72	2.78	4.24
Common	3.62	3.58	2.74	3.99

## TIMOTHY

### RECOMMENDED VARIETIES

**Climax**—Selected by Experimental Farms Service, Ottawa, Canada, from a wide collection of seedlots by combining several progeny tested clones. Described as tall, fine stemmed, and leafy. Superior forage yield under Minnesota conditions.

**Itasca**—A composite of seven inbred lines selected at the Minnesota Agricultural Experiment Station. Good forage and seed yielder. Time of maturity the same as commercial sorts. Highest forage yielder in regional tests.

**Lorain**—Selected from collections from old meadows and roadsides by the Ohio Agricultural Experiment Station. Good forage and seed yielder. Approximately a week later in maturity than Itasca and commercial.

### OTHER VARIETIES

**Clair**—Extremely early strain increased by the Kentucky Experiment Station at Lexington. A naturalized strain from the farm of Clair Andrew, VeVay, Indiana.

**Drummond**—Selected at MacDonal College, Quebec. Winterhardy with an appreciable amount of rust resistance.

**Engmo**—The best adapted forage variety for Alaska conditions. May be useful for future seed production in Minnesota.

**Essex**—Bred at the New York Agricultural Station, Ithaca. It is a very late maturing leafy type.

**Milton**—Selected at MacDonal College, Quebec. It is winterhardy and early maturing.

**Verdant**—A late variety bred at the Wisconsin Agricultural Experiment Station, Madison.

Table 25. Yields and time of bloom of timothy varieties

	Forage yields, tons/acre					
	Rosemount 1962-67, 68	Waseca 1962, 63, 67	Lamberton 1963-65	Morris 1963, 65, 68	Crookston 1962, 65-67, 68	Grand Rapids 1963, 65, 68
Climax	2.62	2.38	3.36	2.82	2.59	4.16
Itasca	2.71	2.47	2.95	2.85	2.95	4.19
Essex	2.43	1.76	2.44	2.69	2.40	3.31

	Seed yields, pounds/acre				Maturity Rosemount, % bloom July 1, 1964
	Rosemount 1964	Grand Rapids 1964	Grand Rapids 1966	Average of 3 locations	
Climax	427	242	324	331	8*
Itasca	334	194	252	260	27
Essex	273	224	212	236	10

\* In other observations Climax was closer to Itasca in time of bloom.

## SUDANGRASS, SORGHUM-SUDAN AND SWEET SORGHUMS

Sudangrass and sorghum-sudan hybrids were drilled (7-inch rows) at 30 pounds per acre with ample P and K fertilizer plus the equivalent of 100 pounds N per acre. They were evaluated at the green chop stage (about 4 feet tall at first cut). Two cuttings were obtained at three stations in

1968. In 1969 because of drought, only one cutting was taken at Rosemount. Prussic acid (HCN) contents were generally lower for the sudans than for the sorghum-sudans with a few exceptions.

Sweet sorghums were grown in 30-inch rows with the same fertilization as the sudans and sorghum-sudans. These were harvested at the silage stage. Wide differences in matur-

ity were observed, as shown by the maturity notes and percent heads. The digestibility of the dry matter as measured by an *in vitro* method was higher for corn than sorghum.

Table 26. Yields and other characteristics of sudan, sorghum-sudan hybrids and pearl millet first harvested when about 4 feet tall

Variety or hybrid and company	Tons dry matter per acre		Mg. HCN per 100 gm. D.M. Rosemount		Weight 100 seeds, grams 1969
	3-station average 1968*	Rosemount 1969	1968	1969	
<b>Sudans</b>					
Piper	2.39	.78	17	28	1.1
Trudan II, Northrup King	2.43	.46	25	43	1.5
Trudy, Grace & Co.		1.10		44	1.5
Monarch, Caladino	3.00	1.34	28	27	1.4
Sioux Dan, Acco		1.23		32	1.4
<b>Sorghum-sudan hybrids</b>					
Sordan 88, Northrup King		.88		83	3.2
Sordan 67, Northrup King	2.73	1.21	48	63	2.9
FS 555, Barzen	2.51	.92	44	53	2.9
FS 556, Barzen	2.56	1.19	55	66	2.7
Sx-5, DeKalb	2.88	1.11	36	47	2.4
Sx-6, DeKalb	3.22	1.37	47	62	2.4
Sx-16, DeKalb		1.60		57	2.2
FFR-66, Land O'Lakes	2.73	1.46	53	75	3.1
Pioneer 985	2.69	1.30	41	58	2.9
Pioneer 988		1.30		55	3.2
Sweet Sioux, Acco		1.57	48	59	2.9
Sweet Sioux II, Acco		1.36		67	2.9
Grazer N, Asgrow	2.85	1.38	59	75	2.6
Astro, Asgrow	2.71	1.62	30	38	2.7
78F, Lindsey Funk		1.08		69	2.9
<b>Pearl millet</b>					
Milllex 22, Northrup King	2.19	.91			0.6

\*Three stations in 1968 were Rosemount, Waseca and Morris. In 1969 only one cut taken at Rosemount because of variability of second cut due to drought.

Table 27. Yields and other characteristics of sweet sorghums (corn check) grown in 30-inch rows and harvested at the silage stage

Company and sorghum or corn	Tons dry matter per acre				Percent dry matter digestibility	Height inches	Percent heads or ears	Maturity <sup>1</sup>	
	1968		1969					Rosemount	Lamb-erton
	Lamb-erton	Rosemount	Lamb-erton	Rosemount	1968	1969	Rosemount	Lamb-erton	
<b>Sorghum</b>									
Northrup King 133 (grain sorghum)			4.87	5.68		46	46	D	SD
Northrup King 300			6.13	6.13		62	47	HD	M
Northrup King 318S	7.26	5.29	7.48	6.81	62	65	21	SD	EM
Grace & Co. Sumax	9.35	6.94	8.30	6.89	70	79	10	M	M
Grace & Co. 22F			6.64	7.00		66	35	HD	M
Barzen FS 446	6.62	5.98	9.05	6.82	65	80	5	H	PP
DeKalb FS 4	6.35	5.50	8.59	6.17	66	75	20	SD	M
Pioneer 931	6.55	6.62	9.65	7.04	56	101	4	H	H
Acco 401R	6.06	5.91	7.00	6.77	64	70	36	D	EM
Acco FS 300R	6.25	5.14	6.91	6.10	65	74	12	M	EM
Acco FB 44	5.19	4.51	7.07	6.29	68	69	19	D	M
Asgrow Titan R			7.62	5.89		71	38	HD	M
Asgrow Dairy D	6.76	5.39	7.64	5.91	65	67	4	H	M
Asgrow Duet	5.25	4.80	6.38	5.72	66	64	48	HD	M
Asgrow Beef Builder			7.79	6.71		78	6	SD	PP
<b>Corn</b>									
Cargill HS 50 (sugar)		6.39	11.46	6.29	71	89	4	SD <sup>2</sup>	M
Pioneer 3558 (dent)		6.71	11.47	5.84	71	93	25	50% dent	M
Minhybrid 5301 (dent)		6.28	8.36	6.12	70	86	41	100% dent	M

<sup>1</sup> Maturity — Headed (H), post pollen (PP), early milk (EM), milk (M), soft dough (SD), dough (D), hard dough (HD).

<sup>2</sup> Determined on border rows. Center rows bagged to prevent pollination.

## 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 <sup>1</sup> in pounds	Rate per acre in pounds	Date
Barley <sup>2</sup>	48	72-96	Early spring
Corn <sup>2</sup>	56	8-14	Early May
Flax <sup>2</sup>	56	42-56	April 15 to May 15
<b>Forage Grasses (perennial)</b>			
Bromegrass (with legumes)	14	5-8	Early spring or fall
Kentucky bluegrass (with timothy)	14	8-10	Early spring or fall
Meadow fescue (in mixture with brome and legume)	14-24	3-4	Early spring or fall
Timothy (with legumes)	45	4-6	Early spring or fall
In mixture with brome and legume or reed canary or bluegrass		2-4	
Reed canary	44-48		Early spring or fall:
Alone or with timothy		6-8	after freezeup
<b>Forage Legumes (biennial or perennial)</b>			
Alfalfa	60		With companion grain
Alone		8-12	or flax, early spring;
With grasses		5-8	or alone before Aug. 10
Birdsfoot trefoil	60	3-6	Early spring
Clover	60		Early spring
Red (in mixture)		4-8	
Alsike (in mixture)		2-4	
Ladino (in mixture)		1/2-1	
Sweet Clover	60		Early spring
Alone		10-12	
In mixture		2-4	
Oats <sup>2</sup>	32	64-80	Early spring
Rye	56	56-84	Aug. 25 to Sept. 30
Sorghum <sup>2</sup>	50 (sweet), 56 (grain)		May 25 to June 15
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 1 1/2 bushels of soybeans		10	
Soybeans <sup>2</sup>	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 <sup>2</sup>	60		
Hard Red Spring		75-90	Early spring
Durum		90	Early spring
Winter		75-90	Aug. 20 to Sept. 20
<b>Miscellaneous Crops</b>			
Annual canarygrass <sup>2</sup>	50	40-50	Early spring
Buckwheat	48-50	40-48	June 15 to July 15
Field peas <sup>2</sup>	60	120-225	Early spring
With 1 1/2 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 <sup>2</sup>	60	40	May 20 to June 15
Pinto beans <sup>2</sup>	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

<sup>1</sup> U.S. legal if established. If not established, weight given is that most widely accepted in the United States.

<sup>2</sup> Use fungicide seed treatment.