

Varietal Trials

OF FARM CROPS



AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF MINNESOTA

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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.

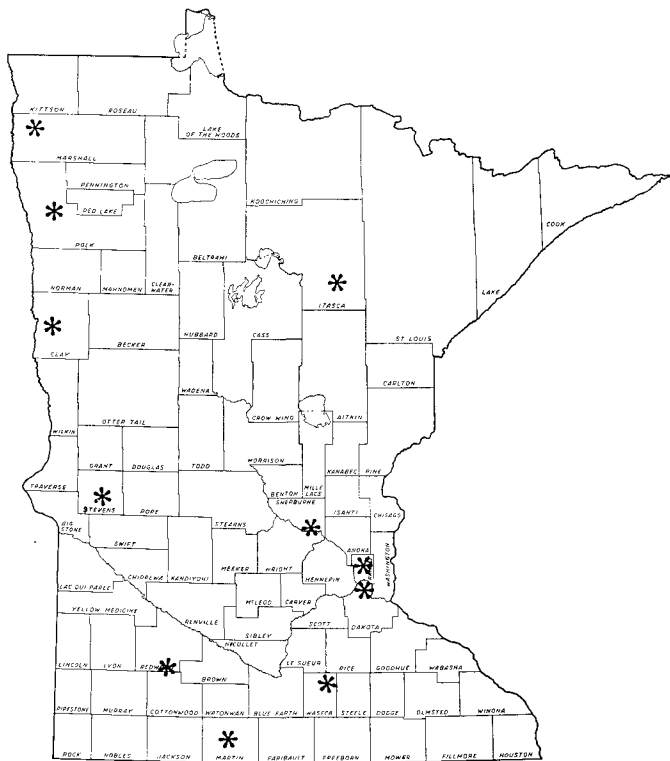
On the basis of these comparative trials, the list of varieties recommended for use in Minnesota is revised each year by the Experiment Station Crop Variety Review Committee.

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.



* 1972 varietal trials were conducted at these locations.

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 1973 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. Rasmussen; 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 R. L. Thompson 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.

BARLEY

RECOMMENDED VARIETIES

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

Cree—Yields more than Larker or Dickson. Similar to Larker in maturity and lodging reaction. Resistant to loose smut, and moderately resistant to spot blotch and Septoria leaf blotch. Kernel plumpness similar to Dickson. Classified as a nonmalting variety by MBIA. Recommended for feed purposes only. Six-row, rough-awn, colorless aleurone. Short rachilla hairs. Developed at the Minnesota Agricultural Ex-

periment Station from crosses involving Trill, Br. 5750-2 and Dickson. Released in 1972.

Dickson—Yields more than Larker when leaf diseases are present. Resistant to prevalent leaf spotting diseases. Kernel plumpness inferior to Larker. Susceptible to loose smut. Classified as a malting variety by MBIA. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Developed by North Dakota Agricultural Experiment Station from crosses involving Trill, Kindred, and CI 7117-77. Released in 1964.

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

VARIETIES NOT ADEQUATELY TESTED

Bonanza—Similar to Conquest in yield, but somewhat more susceptible to lodging and matures about 2 days later. Resistant to stem rust and loose smut. Malting quality status in the U.S. undetermined. Six-row, semi-smooth awn, long rachilla hairs, blue aleurone. Developed by Canada Department of Agriculture at Brandon, Manitoba, from a cross involving Vantage, Jet, Vantmore, Parkland, and Conquest. Released in 1970.

OTHER VARIETIES

Burk—Lower than Dickson, Cree and Nordic 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. Six-row, smooth-awn, long rachilla hairs, colorless aleurone. Developed by Wisconsin Agricultural Experiment Station from a cross of Wisc X691-1 and Swan. Released in 1971.

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

Prilar—Lower yield than Cree and Nordic. Height, maturity, lodging reaction, and disease resistance similar to Larker. Malting quality status undetermined. Six-row, smooth-awn, long rachilla hairs, colorless aleurone. Developed at South Dakota Agricultural Experiment Station from a cross of Primus and Larker. Released in 1971.



Agronomist D. C. Rasmussen compares Cree and Nordic barley varieties. Lodging is more severe in the front half of the plots that received more nitrogen than the rear half.

Nordic—Yields more than Dickson or Larker. Taller than Larker, but similar in lodging resistance. Resistant to leaf spotting diseases including Septoria leaf blotch. Classified as a nonmalting variety by MBIA. Recommended for feed purposes only. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Developed by North Dakota Agricultural Experiment Station from crosses of Dickson, CI 4738, Trill, and UM 570. Released in 1971.

Table 1. Yield of barley varieties in bushels per acre in Minnesota, 1968-72

Variety	Morris 7*	Crookston 7	St. Paul 3	Stephen 2	Lamberton 2	Average (21 trials)
Dickson	69	74	69	83	54	71
Larker	68	75	64	76	68	71
Nordic	73	77	72	85	58	74
Cree	68	77	77	87	59	73
Conquest	68	75	73	74	67	71
Bonanza	67	76	77	90	56	73
LSD 5%	4	5	7	9	9	3

* Number of trials.

Table 2. Characteristics of barley varieties, 1968-72

Variety	Yield, bushels/acre		Heading (June)	Height (inches)	Lodging (%)	Plump Kernels (%)	Reactions to disease‡		
	31 trials*	51 trials†					Stem rust	Loose smut	Leaf spotting
Dickson	62	62	28	33	43	43	R	S	R
Larker	61	60	26	33	43	69	R	S	S
Nordic	64	65	27	34	51	57	R	S	R
Cree	64	65	27	32	45	43	R	R	MR
Burk	62	62	26	35	44	69	R	S	MR
Prilar	60	61	24	34	49	66	R	S	S
Bonanza	62	63	28	37	49	55	R	R	S
Conquest	63	62	26	38	37	61	R	R	S

* Trials in Minnesota and North and South Dakota, 1968-1972.

† Trials in North Central States, 1968-1971.

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

Primus II—Moderately high yield. Early. Susceptible to prevalent diseases, except stem rust. Good kernel plumpness. Not classified as a malting variety by MBIA. Six-row, smooth-

awn, long rachilla hairs, colorless aleurone. Developed by South Dakota Agricultural Experiment Station from crosses of Brandon 3902, Liberty, and Swan. Released in 1966.

OATS

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. Some resistance 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.



Froker and Sioux oats are compared by agronomists D. D. Stuthman and R. M. Granger.

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.

Table 3. Yields of oat varieties in bushels per acre, 1970-72

	Rosemount	Waseca	Lamberton	Morris	Crookston	Grand Rapids	State average
E 68, 69, 70 or 72*	68	69	95	81	79	53	74
Grundy†	76	66	93	70	84	68	76
Minhafer	66	63	84	68	84	52	69
Diana	71	61	85	70	81	68	73
M 68, 69, 70 or 72	82	75	85	86	84	68	80
Garland	60	62	77	67	85	72	71
Otter	72	73	80	75	93	81	79
Chief‡	77	81	92	79	98	66	82
Portal	77	71	93	77	91	65	79
Sioux	76	71	83	75	109	94	84
Lodi	69	66	79	72	105	66	76
Froker	77	85	90	77	97	66	82
Dal‡	66	87	82	78	97	81	82
Cayuse	76§	75§	99§	78§	114	90	89
Mariner‡	..	..	..	..	95	73	..
Frazer‡	..	..	..	..	102	66	..
LSD 5%	6	6	10	7	6	8	3

* Not harvested at Morris and Crookston in 1971.

† 1970 and 1972 only.

‡ 1972 only.

§ 1970 and 1971 only.

VARIETIES NOT ADEQUATELY TESTED

Chief—Medium maturity, high yield, medium height, good lodging resistance, high bushel weight and groat percentage, yellow seed. Heterogeneous crown rust reaction, resistant to smut. Selected at the South Dakota Agricultural Experiment Station from a cross between Clintland 64 and Garland. Released in 1972.

Dal—Late, high yield, medium height, fair lodging resistance, high bushel weight, medium groat percentage, ivory seed. Resistant to crown rust and smut. Selected at the Wisconsin Agricultural Experiment Station from crosses involving Trispermia, Belar, and Beedee. Released in 1972.

Frazer—Late, medium yield and height, poor lodging resistance, low bushel weight and groat percentage, ivory seed. Susceptible to crown rust and smut. Selected in Canada from a cross between Eagle and Roxton.

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.

Mariner—Late, high yield, medium height, good lodging resistance, high bushel weight, medium groat percentage, tan seed. Susceptible to crown rust, resistant to smut. Selected by the Michigan Agricultural Experiment Station from a cross between Garry and a Michigan selection. Released in 1972.

Random—Late, medium yield and height, fair lodging resistance. Susceptible to crown rust and smut. Selected in Canada from a cross between Glen and Pendek. Released in 1971.

OTHER VARIETIES

Cayuse—Late, high yield, short, fair lodging resistance,



Agronomist H. J. Otto inspects a large field of Otter oats at Morris.

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 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, E72)—Early,

Table 4. Characteristics of oat varieties, 1970-72

Variety	Heading (date)	Height (inches)	Lodging (score)*	Bushel weight (pounds)	Groat (percent)†	Reactions to disease§		
						Stem rust‡	Crown rust	Smut
E 68, 69, 70 or 72	6-22	35	2.5	37	75	S	R, S	S
Grundy	23	34	3.1	35	71	S	S	..
Minhafer	24	38	2.7	35	71	MS	MS	R
Diana	24	36	2.6	35	69	S	S	MS
M 68, 69, 70 or 72	25	37	2.6	36	73	S	R, S	S
Garland	25	34	3.0	34	71	S	S	R
Otter	26	35	2.4	34	72	S	S-MS	R
Chief	26	37	2.2	35	73	S	MR	MR
Portal	27	38	3.0	35	72	S	S-MS	R
Sioux	30	38	3.6	33	70	S	S	R
Lodi	30	43	2.5	32	68	S	S-MS	MR
Froker	30	39	2.7	35	71	S	MS	MR
Dal	7-2	39	3.0	35	71	S	R	R
Cayuse	2	34	3.0	31	63	S	MS	..
Mariner¶¶	6-29	32	2.2	35	69	S	S	MR
Frazer¶¶	7-4	33	3.0	31	69	S	S	..

* 1 erect, 5 flat.

† Groat percentage values may be more important than bushel weight, however, the two characters usually are 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, R, S = resistant and susceptible plants in the variety.

¶¶ Crookston and Grand Rapids in 1972 only.

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, M72)—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.

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 per-

centage, 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 resistance, 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.

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.

WINTER RYE

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

RECOMMENDED VARIETIES

Cougar—Medium to high yield, winterhardy, late, medium height. 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.

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

Variety	Rosemount 1970-72	Morris 1970-72	Grand Rapids 1970-72	Average of 3 locations
Cougar	57	61	46	55
Von Lochow	70	51	55	59
LSD 5%	3	5	7	3
Coloma*	59	57	54	57
Kodiak†	39	51	56	49

* 1971-72. † 1972.

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.

Puma—High yield, winterhardy, late, tall, and fair lodging resistance in Canadian trials. Medium size seed of predominantly green color and medium bushel weight. Selected from Dominant by the University of Manitoba. Named and licensed in Canada in 1972.

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.*

Kodiak—Medium yield, winterhardy, medium maturity, tall. Poor lodging resistance. Medium size seed of light tan color and low bushel weight. Selected from Sangaste by the University of Alberta. Named and licensed in Canada in 1971.

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



Experimental rye variety is examined by agronomist R. G. Robinson.

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 6. Characteristics of winter rye varieties, 1970-72

Variety	Winterkill (percent)	Heading (June)	Lodging (score)*	Height (inches)	Weight/100 seeds (grams)	Bushel weight (pounds)
Cougar	14	6	3.9	47	2.4	53.8
Von Lochow	15	3	3.2	50	2.9	55.6
Coloma	6	1	2.9	55	2.7	53.4
Kodiak	3	2	5.3	54	2.6	51.4

* 1 erect, 9 flat.

HARD RED SPRING WHEAT

RECOMMENDED VARIETIES

Tall variety—The following variety performed well and has good quality.

Chris—Awnless, medium height and maturity. Fair resistance to lodging. Resistant to stem rust but ranges from resistant to moderately susceptible to leaf rust. Medium yield and 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.

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 but moderately susceptible to 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 but susceptible to loose smut. 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 Inc. in 1970.

VARIETIES NOT ADEQUATELY TESTED

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. Quality data show lower protein and bake adsorption than Chris. Parentage not disclosed. Released by World Seeds Inc. in 1971.

Napayo—Awned, medium height and maturity. Fair resistance to lodging. Moderately resistant to stem rust but susceptible to leaf rust. Medium yield and bushel weight. Insufficient data on milling and baking characteristics. It is a backcross-derived line using Manitou as the recurrent parent. Released by the Canada Department of Agriculture at Winnipeg in 1972.

Nordak—Awned, medium height and maturity. Fair resistance to lodging. Resistant to stem and leaf rust but susceptible to loose smut. Limited data indicate medium yield and bushel weight. Insufficient data on milling and baking quality. Selected as a single plant in a field of durum wheat by A. H. Berg, Barney, North Dakota. Released to farmers in 1971.

Protor—Awned, early semidwarf with high lodging resistance. Resistant to stem and leaf rust. High yield and medium bushel weight. Limited data indicate low milling and baking quality. Selected from the cross of Tobarí by Ciano. Released by Northrup King in 1972.

OTHER VARIETIES

Bonanza—Awned, early maturing semidwarf with high lodging resistance. Resistant to stem and leaf rust. High incidence of necrotic lesions on leaves. Satisfactory milling characteristics. Protein content and bake absorption are low. Parentage not disclosed. Released by DeKalb Agricultural Research in 1970.

Bounty 208—Awned, early semidwarf with high lodging resistance. Resistant to stem and moderately resistant to leaf rust. Medium yield and low bushel weight. High incidence of necrotic lesions on leaves. Quality data indicate low in protein and bake absorption. Parentage not disclosed. Released by Cargill, Inc. 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. Satisfactory milling and baking characteristics. 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. Satisfactory milling and baking characteristics. 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. Medium yield and bushel weight. Satisfactory milling and baking characteristics. Selected from crosses involving Thatcher, Frontana, Canthatch, and P.I. 170925. Released by the Canada Department of Agriculture at Winnipeg in 1965.

Neepawa—Awnless, early, and medium height. Medium resistance to lodging. Resistant to stem rust but susceptible to leaf rust. Medium yield and bushel weight. Unsatisfactory milling and baking characteristics. Selected from crosses involving Thatcher, Frontana, and Kenya Farmer. Released by the Canada Department of Agriculture at Winnipeg in 1969.

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

Red River 68—Awned, early, semidwarf with high lodging resistance. Resistant to stem and leaf rust. High yield and bushel weight. Unsatisfactory milling and baking characteristics. Parentage not disclosed. Released by World Seeds Inc. 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. Satisfactory milling and baking characteristics. Selected from crosses involving McMurchy, Exchange, and Redman. Released by the Canada Department of Agriculture at Winnipeg, Manitoba, in 1953.



Era, a semi-dwarf variety, is the highest yielding hard red spring wheat variety in experiment station trials according to agronomist R. E. Heiner.

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. Satisfactory milling and baking characteristics. 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 Inc. in 1969.

DURUM WHEAT

RECOMMENDED VARIETIES

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

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. Satisfactory quality 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.

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

OTHER VARIETIES

Hercules—Awned, early, medium height, and high lodging resistance. Resistant to stem rust, susceptible to leaf rust and Septoria. High yield and medium bushel weight. Satis-

factory quality for semolina products. Released by the Canada Department of Agriculture at Winnipeg in 1969.

Lakota—Awned, early, medium height and lodging resistance. Resistant to stem and leaf rust, bunt, and loose smut. High yield and fair bushel weight. Satisfactory quality 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.

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

Wascana—Awned, early, medium height and lodging resistance. Resistant to stem rust and moderately resistant to leaf rust. Medium yield and low bushel weight. Satisfactory quality for semolina products. Selected from crosses involving Lakota and Pelissier. Released by the Canada Department of Agriculture at Winnipeg in 1971.

Table 7. Characteristics of spring wheat varieties, 1970-72

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
Hard Red Spring												
Chris	6-24	40	4.7	R-MS	R	60.8	29	39	46	46	40	high
Era	6-25	30	3.0	R	R	61.2	41	49	59	55	51	low-med.
Fletcher	6-26	30	2.5	MS	R	61.0	33	44	50	47	44	medium
World Seeds 1809‡	6-20	29	2.0	R	R	60.7	42	47	47	36	43	medium
Polk	6-23	39	4.0	R-MS	R	62.5	31	39	49	45	41	v. high
World Seeds 1812	6-22	29	1.7	R	R	61.6	36	40	46	42	41	low
Waldron	6-22	38	2.9	R	R	59.8	40	45	51	40	44	high
Neepawa	6-23	39	4.3	S	R	60.2	36	39	48	44	42	low
Justin	6-24	40	4.5	S	R	58.3	27	31	42	39	35	v. high
Red River 68	6-20	30	1.7	R	R	61.9	40	43	51	49	46	low
Manitou	6-23	39	4.7	S	R	59.8	32	35	45	44	39	high-med.
Bonanza	6-21	29	2.2	R	R	59.4	30	38	44	40	38	med.-low
LSD 5%							4	5	4	4	2	....
Napayo§	6-24	39	4.5	S	MR	60.8	34	..	46	..	40	med.-high
INIA 66¶	6-21	29	3.5	S	R	61.3	31	33	34	37	34	med.-low
Protor**	6-22	29	2.5	R	R	60.3	39	47	54	..	47	low-med.
Bounty 208**	6-22	30	2.5	MR	R	58.7	32	42	40	39	38	med.-low
Lark**	6-22	29	3.0	R	R	59.9	36	31	47	50	41	med.-low
Nordak§	6-23	40	4.5	R	R	60.3	30	..	55	45	43	med.-high
Durum												
Mindum	7-6	47	5.3	R	S	62.1	21	33	39	..	31	....
Wells	7-3	40	4.3	R	R	62.4	27	39	51	..	39	....
Leeds	7-3	39	3.5	R	R	63.1	25	38	46	..	36	....
Hercules	7-2	37	3.5	S	R	61.7	26	40	43	..	36	....
Rolette	6-29	37	3.4	MS-S	R	63.1	32	42	50	..	41	....
Wascana	7-5	42	4.1	MR	R	59.7	27	31	49	..	36	....
Ward	7-1	39	2.4	MR	R	62.3	29	40	50	..	40	....
LSD 5%							4	5	5	..	3	....
Lakota**	6-29	41	2.3	MR	R	60.0	25	43	46	..	38	....

* 1 erect, 9 flat.

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

‡ 1970-71.

§ 1972.

¶ 1970.

** 1971-72.

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. Satisfactory quality characteristics. Selected from a backcross 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. Satisfactory milling and baking characteristics. Re-selection from Winalta by the South Dakota Agricultural Experiment Station in 1968.

OTHER VARIETIES

Froid—Awned; winterhardy; medium height, maturity, and lodging resistance. Moderately resistant to stem rust,

susceptible to leaf rust. High yield, but lower than average bushel weight. Satisfactory milling and baking characteristics. Selected from a population of unknown origin at the Montana Agricultural Experiment Station in 1968.

Warrior—Awned, early, medium height and lodging resistance. Winterhardness is not satisfactory. Susceptible to leaf and stem rust. Medium yield and bushel weight. Satis-

factory quality. 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. Satisfactory bushel weight and quality characteristics. 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, 1970-72*

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	32	39	36
Warrior	6-3	38	15	4	S	S	59.4	44	34	39
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%								7	6	5

* Two years' data.

† 1 erect, 9 flat.

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

§ 1970-71.

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.

Empire—Foxtail. Medium maturity. Poor lodging resistance. Very small, plump, yellow seed. Originated by Canada Department of Agriculture.

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

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.

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.

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

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	Grain yield/acre (pounds)		Bushel weight (pounds)	Rosemount 1970-72, Elk River 1972			Height (inches)
	Rosemount 1970-72	Elk River 1972		Weight/100 seeds (grams)	Heading (August)	Lodging (score)*	
Turghai	2,286	2,341	53.4	.58	10	3.4	40
Panhandle	2,321	1,893	50.7	.68	11	5.4	40
White (type)	2,525	1,931	50.1	.67	11	5.0	40
LSD 5%	254	259					

* 1 erect, 9 flat.

Table 10. Characteristics of foxtail millet varieties

Variety	Yield/acre (pounds)			Rosemount 1968-70, Elk River 1971-72			
	Rosemount 1968-70		Elk River 1971-72	Forage* protein (percent)	Heading (August)	Lodging (score)†	Height (inches)
	Seed	Forage*	Forage*				
Empire	1,649	5,893	6,017	8.7	22	3.3	41
White Wonder	784	6,287	5,866	8.1	31	2.1	43
LSD 5%	322	723	719				

* Oven-dry basis.

† At forage harvest: 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

Table 11. Characteristics of grain sorghum hybrids at Lamberton

Hybrid and originator	Grain yield* per acre (pounds)	Head moisture		Bushel weight (pounds)	Height (inches)	Heading (date)
		Sept. 17 (percent)	October			
<i>Hybrids tested in 1971-72</i>						
1, Minnesota	5,485	30.6	24.1	57.8	61	7-27
101, Northrup King	4,802	32.9	27.0	56.7	47	7-27
Minimilo 54BR, Northrup King	5,055	35.5	25.9	57.2	44	7-30
Grassy Grain 1, Frontier	4,983	35.5	26.0	56.9	51	7-31
894, Pioneer	5,679	37.1	27.0	57.9	40	7-30
R-1010, Acco	6,153	37.5	27.1	59.1	58	8-2
R-920, Acco	5,922	38.7	27.7	57.5	49	7-30
121, Northrup King	5,237	40.0	28.9	57.1	46	8-1
505, Nebraska	4,993	41.7	28.8	58.6	52	8-2
A-25, DeKalb	5,408	40.9	31.5	55.1	45	7-30
DS-60, Payco	4,829	41.7	29.5	58.4	49	8-3
503, South Dakota	6,221	42.1	31.0	57.5	61	8-4
180, Northrup King	6,091	43.8	32.9	58.1	50	8-5
RS-506, South Dakota	6,065	45.1	34.4	57.8	53	8-2
R-1012, Acco	5,046	45.4	34.7	58.5	42	8-4
883, Pioneer	4,659	49.8	39.2	55.4	45	8-8
LSD 5%	606	3.1	2.4			
<i>Hybrids tested in 1972</i>						
8922, Pioneer	4,746	24.4	24.2	57.7	40	7-26
Cms x SD 104, Minnesota	6,423	31.3	24.2	58.5	55	7-27
GX 718, Frontier	5,083	38.0	26.6	54.9	52	7-31
X0081, Pioneer	5,463	38.0	28.4	56.3	41	8-1
X8254, Pioneer	5,393	46.2	35.4	56.0	39	8-10
GX 730, Frontier	4,878	51.7	35.4	53.8	47	8-10
A-26, DeKalb	4,626	50.1	37.8	55.3	41	8-7
X1355, DeKalb	4,956	50.7	38.4	55.0	39	8-8
GX 721, Frontier	4,545	52.5	41.6	52.7	50	8-11
<i>Hybrids tested in 1971</i>						
Minimilo 50A, Northrup King	3,293	30.1	24.2	56.8	45	7-25
120, Northrup King	4,747	38.5	30.5	56.5	50	7-29
125, Northrup King	5,314	39.4	28.9	55.7	51	8-2
133A, Northrup King	4,225	46.3	35.1	59.2	45	8-5

* Oven-dry moisture basis.

yield less than early hybrids in years with low temperatures in August or early September.

Trials were planted about June 1 at the rate of 150,000 seeds per acre in rows 30 inches apart. Hybrids tested in

only 1971 or 1972 are grouped separately in table 11. Hybrids within each group are ranked from earliest to latest based on heading dates and on head moistures in September and at harvest time.

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.



Agronomist E. A. Oelke stands between plots showing that Norstar flax is about 1 day earlier blooming and 1 inch shorter than Nored.

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 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, 1967-72

Variety	Early-sown					Late-sown					Early-late average
	St. Paul	Lamberton	Morris	Crookston	Average	St. Paul	Lamberton	Morris	Crookston	Average	
No. trials	6	3	6	5		3	5	6	5		
Linott	1,485	1,856	1,396	1,130	1,425	637	1,171	1,043	990	998	1,217
Nored	1,438	1,716	1,374	1,164	1,392	634	860	1,045	699	840	1,123
Norstar	1,434	1,814	1,378	1,107	1,392	520	1,036	970	810	874	1,140
Summit	1,305	1,725	1,275	1,131	1,315	651	1,080	963	927	935	1,130
Windom	1,450	1,701	1,306	972	1,325	680	1,077	1,010	841	931	1,133
LSD 5%	96	124	83	95	49	77	100	73	111	47	34

Table 13. Characteristics of flax varieties, 1967-72

Variety	Days from sowing to:		Plant height (inches)	Wt./1000 seeds (grams)	Lodging* (score)	Pasm* (score)	Wilt* (score)	Major† rust genes	Oil‡ (percent)	Iodine‡ (no.)
	First bloom	Full bloom								
No. trials	36	35	36	23	12	8	11		47	45
Linott	50	55	23	5.2	4.2	4.5	5.8	L*	40.9	182
Nored	54	59	25	5.9	3.2	3.3	2.8	N ¹	40.5	185
Norstar	53	58	25	5.6	3.5	3.4	2.9	LN ¹	40.2	180
Summit	51	56	23	5.7	4.0	5.0	4.0	N ¹	39.1	183
Windom	51	56	23	5.5	4.6	5.4	1.9	N ¹	39.4	185

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

† All varieties immune to North American races of rust.

‡ Data were obtained from trials in north central area, no 1972 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 Minnesota production areas to varietal recommendations in the text.

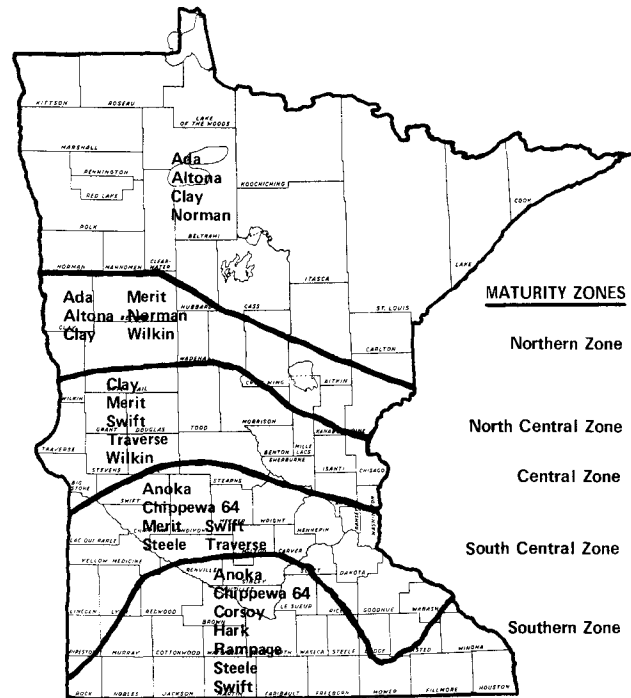
Yield data reported in table 14 for St. Paul, Crookston, Moorhead, Morris, Lamberton, and Waseca are from replicated, combine-harvested plots. The data from Grand Rapids, Fairmont, and the sand plain are from replicated, multiple-row nursery plots. The spacing between rows was 24 inches at Grand Rapids and 28 inches at Crookston. At Moorhead it was 36 inches in 1970, 28 in 1971, and 22 in 1972. 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 two-thirds of May. The early planting dates at Waseca and Lamberton ranged from April 29 to May 5. The very late planting dates at Waseca and Lamberton ranged from June 29 to July 6.

Varieties are grouped into three maturity categories. Certain transitional varieties appear in more than one maturity grouping, because varying numbers of years or plot locations may be involved between groupings.

Data on maturity, lodging resistance, plant height, seed size, and seed quality, in table 15, are from locations suited to particular maturity groups. Phytophthora reactions were determined by the University of Minnesota's Department of Plant Pathology and by the U.S. Regional Soybean Laboratory, Urbana, Illinois. Chlorosis scores were obtained from plantings at the Crookston Experiment Station and on a high-lime soil near Lamberton. Protein and oil determinations were made at the regional laboratory and are available for 1970 and 1971 only.

RECOMMENDED VARIETIES

Ada—Recommended for the northern and north central zones. Excellent seedling vigor. Resistant to phytophthora



root rot. Good tolerance to high-lime soils. Developed at the Minnesota Agricultural Experiment Station from a cross of Merit and Norman. Released in 1972.

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 recommended 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, nonrecurrent backcross parent in the development of Chippewa 64. 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.



Numerous trials have shown that soybeans produce higher yields in narrow than in wide rows. This is especially true for early maturing varieties like Norman. Here, agronomist J. W. Lambert examines such a trial.

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 1972. 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. Resistant to phytophthora root rot. 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 Haradome. Released in 1969.

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.

Steele—Recommended for south central and southern maturity zones. High yield in comparison with Chippewa 64. Resistant to phytophthora root rot. Developed at the Minnesota Agricultural Experiment Station from a cross of Blackhawk and Harosoy. Released in 1972.

Swift—Recommended for the south central, central, and southern maturity zones. High yield and oil content. Very good tolerance to high-lime soils. Only fair resistance to lodging. Susceptible to phytophthora root rot. Developed at the Minnesota Agricultural Experiment Station from crosses involving Lincoln, Richland, Capital, and Korean. Released in 1972.

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.

Wilkin—Recommended for the central and north central maturity zones. High yield. Excellent resistance to lodging. Resistant to phytophthora root rot. Good tolerance to high-lime soils. Developed at the Minnesota Agricultural Experiment Station from a cross of Merit x Harosoy. Released in 1972.

VARIETIES NOT ADEQUATELY TESTED

Wells—Similar in maturity to Corsoy. Greater resistance to lodging than Corsoy. Resistant to phytophthora root rot. Developed at the Indiana Agricultural Experiment Station from crosses involving Harosoy, Lincoln, Ogden, and Blackhawk. Released in 1972.

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.

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

Portage—Earlier than Norman. Good resistance to lodging. Susceptible to shattering, to chlorosis on high-lime soils, and to phytophthora root rot. Developed at the University of Manitoba from a cross of Acme and Comet. Released in 1964.

Vansoy—Similar to Clay in maturity but yields less than Clay. Susceptible to phytophthora root rot. Developed at the

Ontario Agricultural College from crosses involving Lincoln, Flambeau, and Goldsoy. Released in 1970.

Wirth—Similar in maturity and yield to Anoka but 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 from a cross of Chippewa and Clark. Released in 1969.

Table 14. Yields of soybeans in bushels per acre

Variety	Crookston	Grand Rapids	Moorhead	Morris	Sand Plain	St. Paul	Waseca			Lamberton			Fairmont
	1969, 1971	1969, 70, 1972	1970, 72	1969, 72	1969, 70, 1972	1969, 72	Early planting date	Normal planting date	Very late planting date	Early planting date	Normal planting date	Very late planting date	1971, 72
	72	72	72	72	72	72	72	72	72	72	72	72	72
Early-maturing group													
Norman	20	34	24	25					23			20	
Altona	16	34	25	..					22			20	
Ada	20	31	24	26					..			..
Morsoy	19	31	25	26					..			..
Wilkin	22	36	26	28					..			..
Clay	20	35	29	29					22			22	
Merit	18	26	..	30					..			..
LSD 5%	2	3	2	2					2			2	
Medium-maturing group													
Clay			30	29	29	32			..		..		..
Merit			29	28	31	32			35		32		43
Traverse			26	29	31	30			36		31		44
Swift			27	31	30	37			39		34		45
Chippewa 64			..	26	30	30			36		31		44
Wirth			..	28	31	31			38		33		47
Anoka			..	30	34	33			38		32		46
Dunn			..	27	34	32			38		32		43
Steele			..	28	36	33			38		35		45
LSD 5%			2	2	4	3			2		2		4
Late-maturing group													
Chippewa 64							38	36		35	31		46
Rampage							42	38		38	30		49
Hark							42	41		40	34		50
Corsoy							45	42		42	37		54
Amsoy 71							42	38		39	33		53
Wells							..	..		..	..		52
LSD 5%							2	2		2	1		4

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)	Phytophthora‡ (reaction)	Chlorosis (score)*	Flower (color)§	Pubescence (color)§	Hilum (color)§
Early-maturing group (average of Crookston and Morris, 1971-72)												
Norman	9-17	1.8	23	16.6	2.6	41.0	21.1	S	1.9	P	G	Y
Altona	9-20	2.0	26	18.5	2.8	41.1	20.7	R	3.3	P	T	B
Ada	9-20	1.7	28	17.1	2.4	40.1	20.5	R	1.5	W	G	Y
Morsoy	9-22	2.6	27	19.5	3.6	38.5	22.3	S	2.4	P	G	lb
Wilkin	9-27	1.2	26	15.4	2.5	39.0	22.5	R	1.7	W	G	Y
Clay	9-26	1.9	26	17.5	2.6	40.6	22.5	S	2.1	P	G	Y
Merit	10-1	1.5	30	15.3	3.0	39.9	21.9	R	2.0	W	G	Bf

Table 15. Characteristics of soybean varieties (continued)

Variety	Mature (date)	Lodging resistance (score)*	Plant height (inches)	Weight of 100 seeds (grams)	Seed quality (score)*	Protein† (percent)	Oil† (percent)	Phytophthora‡ (reaction)	Chlorosis (score)	Flower (color)	Pubescence (color)	Hilum (color)§
Medium-maturing group (average of St. Paul and Morris, 1969-72)												
Clay	9-11	2.1	27	15.8	2.6	40.1	22.6	S	1.6	P	G	Y
Merit	9-18	2.6	35	13.4	2.3	39.2	21.5	R	2.1	W	G	Bf
Traverse	9-20	2.7	34	15.8	2.4	40.9	21.2	S	3.3	W	G	Y
Swift	9-23	3.1	38	15.0	2.8	38.4	22.3	S	1.4	W	T	B
Chippewa 64	9-24	2.5	36	13.7	2.4	39.5	21.0	R	2.1	P	T	B
Wirth	9-25	2.5	36	14.0	2.3	40.5	20.7	S	1.9	P	T	B
Anoka	9-26	3.1	34	17.6	2.4	39.4	22.7	S	4.5	P	T	B
Dunn	9-26	2.9	35	15.3	2.3	39.9	21.1	S	2.2	P	T	B
Steele	9-27	2.7	38	15.3	2.3	39.6	21.6	R	2.3	P	G	Y
Late-maturing group (average of Waseca and Lamberton, 1969-72)												
Chippewa 64	9-16	1.5	36	15.2	2.3	40.6	21.2	R	2.1	P	T	B
Rampage	9-22	1.6	35	16.5	2.1	41.2	21.4	S	1.9	P	T	B
Hark	9-24	1.8	40	17.4	2.0	42.2	20.9	S	4.1	P	G	Y
Corsoy	9-24	2.6	40	16.0	2.0	40.2	22.0	S	2.5	P	G	Y
Amsoy 71	9-29	2.3	44	18.5	2.1	39.6	22.7	R	2.2	P	G	Y
Wells	9-25	1.8	39	16.4	2.2	40.5	22.0	R	2.5	P	G	lb

* 1 = excellent, 5 = very poor.

† Moisture-free basis.

‡ R = resistant, S = susceptible.

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

SUNFLOWERS

Varieties grown for use as nutmeats, salted whole seed, or birdfeed are called nonoil varieties, and those grown for oil and protein extraction are called oilseed varieties.

NONOIL 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.

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.

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.

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. 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.

OILSEED VARIETIES

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

Issanka—Medium to high yield. Medium maturity and short. Small seed of medium bushel weight and oil percentage. Selected in France from VNIIMK 8883. Inferior to Peredovik in both yield and oil in French trials, 1969-71.

Luch—Medium to high yield. Late and tall. Small black seed of high bushel weight and low hull and very high oil percentages. Originated in Russia about 1966.

Peredovik—Medium to high yield. Late and tall. Small black seed of medium bushel weight and low hull and very high oil percentages. Some tolerance to rust and leaf mottle diseases. Peredovik 66 is less uniform, later, taller, and slightly higher in oil. Developed in Russia.

Record—Medium yield. Later and taller than Peredovik. Small black seed of medium bushel weight and low hull and very high oil percentages. Selected from VNIIMK 89.31 in Rumania.

Sputnik—Medium to high yield. Late and tall. Small black seed of high bushel weight and low hull and very high oil percentages. Originated in Russia about 1966.

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. Some tolerance to rust and leaf mottle diseases. VNIIMK 89.31 66 is less uniform, later, taller, and slightly higher in oil. Developed in Russia.

OILSEED HYBRIDS

Although sunflower hybrids have been available for 25

years, the method of seed production often failed to produce a high percentage of hybrids from large crossing fields. The release of genetic male sterile lines in 1968 made consistent hybrid seed production in large fields agronomically feasible, but the large amount of hand labor for roguing seed fields made costs too high. In countries with low labor costs, genetic male sterile lines have been used to grow seed for sale in the U.S.

The discovery of cytoplasmic male sterile lines and fertility restoring lines is expected to make hybrid seed production practical in the U.S. The available sterile lines were

Table 16. Yields of sunflower varieties in pounds per acre, 1971-72

Variety	Crookston 1971-72	Grand Rapids 1971-72	Morris 1972	Rosemount 1971	Adjusted Average
Nonoil varieties					
Arrowhead	1833	1534	1429	2102	1725
D-693 (partial hybrid)	1697	1070	1137	1945	1462
D-694 (partial hybrid)	1753	1376	1091	1990	1553
Mingren	1463	1065	1168	2249	1486
Oilseed varieties					
Peredovik 66	1463	1264	1413	2080	1555
VNIIMK 89.31 66	1508	1117	1660	2121	1602
Issanka*	1453	....	1314	2279	1574
Luch*	1161	1462	1646	....	1589
Sputnik*	1528	1577	1528	....	1710
Oilseed hybrids produced by genetic male sterility methods					
P-21 VR1 x HA60	1860	1525	1685	2852	1981
(P-21 VR1 x P-21 VR2) x HA60	2047	1571	1915	2439	1993
Rumania hybrid 52	1427	1528	1905	2000	1715
Rumania hybrid 53	1486	1399	1644	1880	1602
Rumania hybrid HS301*	1449	1221	1948	....	1705
Oilseed hybrids produced by the cytoplasmic male sterility-restorer method*					
cms HA60 x RHA265	1461	1684	1447	....	1696
cms HA89 x RHA265	918	799	1634	....	1283
cms HA99 x RHA265	1208	849	1329	....	1294
cms HA113 x RHA265	1285	646	1777	....	1402
cms HA124 x RHA265	1172	702	1826	....	1399
cms HA234 x RHA265	1315	1239	2230	....	1760
cms HA60 x RHA266	1362	1762	1963	....	1861
cms HA89 x RHA266	1412	1001	1848	....	1586
cms HA99 x RHA266	1384	1384	1719	....	1661
cms HA113 x RHA266	1314	2368	1838	....	2006
cms HA232 x RHA266	1091	784	1870	....	1414
cms HA234 x RHA266	1620	1363	2130	....	1870
(cms HA89 x HA60) x RHA265	1358	....	1903	....	1718
(cms HA99 x HA60) x RHA265	1503	....	2278	....	1978
(cms HA89 x HA232) x RHA265	1205	....	1751	....	1566
(cms HA89 x HA60) x RHA266	1057	....	1529	....	1381
(cms HA89 x HA232) x RHA266	1057	....	1448	....	1340
LSD 5%	272	440	523	523	226

* Not tested in 1971.

developed from cytoplasmic male sterile material obtained from France in 1968. The restorer lines, RHA265 and RHA266, were released by the Texas Agricultural Experiment Station-U.S. Department of Agriculture in October 1971.

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

Table 17. Characteristics of sunflower varieties, 1971-72

Variety	Flowering (date)	Lodging (score)*	Height (inches)	Seed			
				Weight/100 (grams)	Large† (percent)	Bushel weight (pounds)	Oil‡ (percent)
Nonoil varieties							
Arrowhead	7-22	1.7	76	7.6	1	28.8	31.1
D-693 (partial hybrid)	7-26	2.4	75	9.7	32	24.5	28.8
D-694 (partial hybrid)	7-26	2.0	76	10.5	33	24.9	27.8
Mingren	7-26	2.0	73	10.9	60	23.4	26.9
Oilseed varieties							
Peredovik 66	7-31	3.1	78	5.6	0	29.0	45.5
VNIIMK 89.31 66	8-1	2.7	80	5.6	0	29.1	44.4
Issanka§	7-28	2.5	66	6.0	0	27.5	42.5
Luch§	7-31	2.3	79	5.3	0	30.2	45.1
Sputnik§	7-30	2.3	76	5.9	0	30.5	48.0
Oilseed hybrids produced by genetic male sterility methods							
P-21 VR1 x HA60	7-28	2.5	74	5.9	0	29.6	41.2
(P-21 VR1 x P-21 VR2) x HA60	7-29	2.9	77	5.6	0	29.5	38.6
Rumania hybrid 52	7-31	2.1	74	4.6	0	26.6	45.6
Rumania hybrid 53	8-1	2.1	78	5.0	0	25.8	42.7
Rumania hybrid HS301§	8-1	2.6	74	5.9	0	29.8	46.1
Oilseed hybrids produced by the cytoplasmic male sterility-restorer method§							
cms HA60 x RHA265	8-5	2.2	84	5.1	0	29.5	39.0
cms HA89 x RHA265	8-7	1.7	79	4.5	0	31.6	47.6
cms HA99 x RHA265	8-8	1.9	84	4.4	0	31.1	45.6
cms HA113 x RHA265	8-6	1.7	77	4.8	0	30.6	47.1
cms HA124 x RHA265	8-7	2.1	80	4.7	0	29.4	44.2
cms HA234 x RHA265	8-2	1.7	78	5.5	0	33.8	47.5
cms HA60 x RHA266	8-7	1.9	81	4.8	0	30.9	39.8
cms HA89 x RHA266	8-5	2.2	79	4.9	0	31.6	47.6
cms HA99 x RHA266	8-8	1.7	81	4.4	0	31.6	48.3
cms HA113 x RHA266	8-6	1.9	80	5.0	0	31.9	47.0
cms HA232 x RHA266	7-31	1.9	76	5.2	0	31.7	44.4
cms HA234 x RHA266	8-4	2.4	78	5.0	0	33.4	45.1
(cms HA89 x HA60) x RHA265	8-6	2.0	88	4.7	0	31.0	43.4
(cms HA99 x HA60) x RHA265	8-6	2.4	83	5.2	0	31.3	42.2
(cms HA89 x HA232) x RHA265	8-3	2.1	81	5.0	0	32.9	48.2
(cms HA89 x HA60) x RHA266	8-5	2.5	85	4.8	0	29.7	43.1
(cms HA89 x HA232) x RHA266	8-2	2.0	79	5.1	0	31.8	45.7

* 1 erect, 9 flat. † Held on a 20/64 round-hole screen. ‡ Oven-dry basis. § Not tested in 1971.

(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-U.S. Department of Agriculture.

Hybrids of cms HA60, cms HA89, cms HA99, and cms HA113, cms HA124, cms HA232, and cms HA234 cytoplasmic male sterile lines and RHA265 and RHA266 pollen-restorer lines—Medium to high yield. Late and tall. Small seed of high bushel weight and very high oil percentage. Cms HA60 hybrids have striped seed and other hybrids, dark seed. All are resistant to rust and some are resistant to leaf mottle. Parents released by the Texas Agricultural Experiment Station-U.S. Department of Agriculture in 1971.

Hybrids of cms Cargill lines and RHA265 and RHA266 pollen-restorer lines—Similar to the Texas-U.S. Department of Agriculture experiment station hybrids in yield and performance. Developed by Cargill Inc. Some will be released for 1973 production.

Rumanian hybrids 52, 53, and HS301—Medium to high yield. Late and medium to tall. Small black seed of low to medium bushel weight and high to very high oil percentages. Developed at the Research Institute, Bucharest-Fundulea, Rumania.



The upright small heads in this plot being examined by agronomist R. G. Robinson will bend down like the others when flowering is complete.

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. Grown for forage, feed grain, and soup market. Originated by Canada Department of Agriculture from crosses involving Chancellor, Early Raymond, and Stirling. Licensed in 1960.

Trapper—Medium to early. Medium vine length. Small, cream-colored seed. Good cooking quality. Grown for forage,

feed grain, and pigeon feed market. Originated at the Morden Experimental Farm, Canada Department of Agriculture, from a cross of Chancellor x Weibull's 700. Released in 1970.

OTHER VARIETIES

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

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)	Vine length (inches)	Sowing rate/acre (pounds)
	Elk River 1970-72	Crookston 1966-68					
Century	2,062	1,958	21.4	24.6	6-22	47	211
Trapper	1,821	1,619	12.4	26.4	6-19	32	111
LSD 5%	239	658					

* Oven-dry basis.

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.

There are more than 15 market classes of dry, edible beans, but less than eight have been grown commercially in Minnesota. Varietal recommendations are confined to navy and pinto because they are grown on more acres than the other market classes. However, some varieties in the pink, kidney, great northern, small red, cranberry, brown, yellow-eye, and black turtle soup classes also are adapted in Minnesota but tended to yield less than UI-114 pinto in trials at Rosemount. Relative performance of important varieties of

pinto, navy, pink, kidney, and great northern are reported in table 19 because these five classes were grown on Minnesota farms in 1971.

Relative yields, contract prices, and quality requirements of the various classes should be considered by bean growers. For more information, see Minnesota Extension Bulletin 310 and Experiment Station Miscellaneous Report 112.

RECOMMENDED VARIETIES

Sanilac navy—Medium yield. Medium-late maturity. Erect bush. Small white seed. Selected from crosses involving mutant (X-ray induced) bush Michelite and an anthracnose-resistant line. Resistant to anthracnose and mosaic V-1.

Tolerant of halo blight. Much less injury from rust than pinto in 1972. Susceptible to white mold and common and fuscous blights. Released by the Michigan Agricultural Experiment Station in 1956.

Seafarer navy—Medium yield. Early. Erect bush. Small white seed. Selected from crosses involving X-ray bush mutants, Emerson 847, Michelite, Trag 279-1, and Florida Belle. Resistant to anthracnose and mosaic V-1, V-1A, V-15. Tolerant of halo blight. Much less injury from rust than pinto in 1972. Susceptible to white mold and common and fuscous blights. Released by the Michigan Agricultural Experiment Station in 1967.

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

OTHER VARIETIES

Gratiot navy—Medium yield. Medium-late maturity. Erect bush. Small white seed. Disease resistance similar to Seafarer. Released by the Michigan Agricultural Experiment Station in 1963.

Ouray pinto—Medium yield. Medium maturity. Semi-erect bush. Tan and brown mottled seed. Named by the Colorado Agricultural Experiment Station in 1972.

Seaway navy—Low yield. Early. Erect bush. Small white seed. Disease resistance similar to Seafarer but lacks resistance to anthracnose. Selected from crosses involving mutant

(X-ray induced) bush Michelite and Topcrop. Released by the Michigan Agricultural Experiment Station in 1960.

UI-111 pinto—Medium to high yield. Early. Prostrate vine. Tan and brown mottled seed. Disease resistance similar to UI-114 but lacks resistance to mosaic V-1A. Released by the Idaho Agricultural Experiment Station before 1950.



Rust disease caused serious losses in some dry bean fields in Renville County. County extension agent P. J. Maher and pathologist H. G. Johnson search for rust pustules.

Table 19. Characteristics of field bean varieties

Variety and class	Rosemount 1968-72			Lamberton 1972	Growth form
	Tested (years)	Mature (date)	Seed yield/acre (pounds)	Seed yield/acre (pounds)	
UI-114 pinto	5	8-28	2,674	2,119	vine
UI-111 pinto	3	8-24	2,068	2,084	vine
Ouray pinto	3	8-25	1,754	....	bush
Sanilac navy	4	8-28	1,866	1,907	bush
Seafarer navy	4	8-21	1,823	1,644	bush
Gratiot navy	2	8-28	1,586	1,540	bush
Seaway navy	3	8-22	1,524	....	bush
Sutter pink	3	9-3	2,096	2,327	vine
Manitou light red kidney	3	9-7	1,819	....	bush
Charlevoix dark red kidney	1	8-31	1,995	1,608	bush
UI-59 great northern	4	8-26	2,153	....	vine
Tara great northern	3	9-9	2,356	....	vine
Jules great northern	2	9-11	2,328	....	vine
Emerson great northern	1	8-30	2,470	....	vine
LSD 5%			208	399	

ALFALFA

Many alfalfa varieties are available from both private and public plant breeders. It is recommended that certified seed be used because it provides the best assurance of varietal purity and performance. For this reason only varieties where certified seed is available are listed in this report. Variety descriptions and performance data are given to provide a basis for alfalfa growers to select varieties that fit their needs. When selecting a variety, study the data available and consider the following factors.

WINTERHARDINESS—Severe Minnesota winters make winterhardness 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 gen-

erally 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.

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 20 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 21. 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. 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 73 test years in southern Minnesota, the variety Ranger yielded significantly more than Vernal in only three test years; it yielded equal to Vernal in 59 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.

Varieties are classified in table 22 for 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 20. 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 21. Number of test years in which certified alfalfa varieties yielded more than (+), equal to (=), or less than (-) Vernal*

Variety according to winterhardiness	Crookston			Fargo, N.D.†			Grand Rapids			Total 3 north locations			Lamberton			Morris			Rosemount			Waseca			Total 4 south locations		
	+	=	-	+	=	-	+	=	-	+	=	-	+	=	-	+	=	-	+	=	-	+	=	-	+	=	-
Very winterhardy																											
Beaver	0	3	0	0	2	0	2	0	0	2	5	0	0	2	0	0	2	0	0	5	3	0	2	0	0	11	3
Norseman	0	5	0	0	10	0	1	3	0	1	18	0	0	2	0	0	2	0	0	2	1	0	2	0	0	8	1
Teton	0	0	0	0	5	5	0	0	0	0	5	5	0	0	0	0	2	0	0	1	2	0	0	0	0	3	2
Travois	0	0	0	0	8	4	0	0	0	0	8	4	0	0	0	0	2	0	0	0	3	0	0	0	0	2	3
Winterhardy																											
ATRA 55	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	3	1	0	0	0	0	3	1	0
Dawson	0	0	0	0	6	0	0	0	0	0	6	0	2	3	0	0	2	0	0	4	1	0	0	0	2	9	1
Iroquois	0	2	0	0	0	0	0	3	0	0	5	0	1	4	0	1	1	0	0	10	0	1	0	0	3	15	0
Ladak	0	0	0	0	25	1	0	0	0	0	25	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ladak 65	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	2	0	1	3	1	0	0	0	1	5	1
Narragansett	0	5	0	0	15	0	1	3	0	1	23	0	0	7	0	1	3	0	0	11	3	0	3	0	1	24	3
Progress	0	5	0	0	2	0	0	3	1	0	10	1	2	5	0	0	2	0	0	10	1	0	3	0	2	20	1
Ranger	0	10	0	0	20	0	0	5	3	0	35	5	0	13	1	2	7	1	1	34	8	0	5	1	3	59	11
Scout	0	2	0	0	2	0	0	2	0	0	6	0	0	5	0	1	2	1	0	13	2	0	1	0	1	20	3
Team	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	2	5	0	0	0	0	2	5	0
Titan	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	1	10	0	0	0	0	1	10	0
Weevlchek	0	1	1	0	1	0	0	1	0	0	3	1	0	1	0	2	0	0	2	5	0	0	1	0	4	7	0
WL 202	0	5	0	0	2	0	1	3	0	1	10	0	0	7	0	0	2	0	1	8	1	0	3	0	1	20	1
WL 215	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
123	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	2	0	0	7	0	0	0	0	0	9	0
153	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	4	1
520	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	1	0	4	0	0	0	0	0	5	1	0
522	0	5	0	0	0	0	0	4	0	0	9	0	0	7	0	0	0	0	0	9	1	0	3	1	0	19	2
525	0	5	0	0	2	0	0	4	0	0	11	0	0	7	0	0	0	0	0	7	3	0	3	0	0	17	3
Victoria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0
Vernal																											
(tons hay/acre)	3.50			4.19			4.31			4.03			4.43			4.16			4.83			4.67			4.65		
Moderately winterhardy																											
A24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	1	1	2
A59	0	2	0	0	0	0	0	2	0	0	4	0	2	3	0	0	0	0	1	6	0	0	1	0	3	10	0
Anchor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	2	1	0
Apex	0	2	0	0	2	0	1	1	0	1	5	0	0	5	0	0	5	0	1	11	1	0	1	0	1	22	1
Bonus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3	0	0	0	0	0	5	0
Cardinal	0	5	0	0	5	0	0	3	1	0	13	1	0	6	1	0	5	1	0	6	4	0	2	1	0	19	7
DuPuits	0	4	1	0	10	3	1	3	1	1	17	5	1	4	2	0	6	0	0	13	7	0	2	1	1	25	10
Europa	0	5	0	0	4	0	2	1	1	2	10	1	0	6	1	0	6	0	0	6	4	0	2	1	0	20	6
Glacier	1	4	0	0	5	0	2	1	1	3	10	1	0	7	0	0	7	0	0	10	2	0	3	0	0	27	2
Kanza	0	0	0	0	2	2	0	0	0	0	2	2	0	0	0	0	2	0	0	4	1	0	0	0	0	6	1
Saranac	2	7	0	0	7	1	3	5	0	5	19	1	0	13	0	2	7	1	4	22	1	1	6	1	7	48	3
Stride	0	2	0	0	0	2	1	1	0	1	3	2	0	4	1	1	3	0	0	6	2	0	0	1	1	13	4
Tempo	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	3	7	0	0	0	0	3	7	0
Thor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
Warrior	0	5	0	0	5	0	0	4	0	0	14	0	0	7	0	1	6	1	0	9	1	0	2	1	1	24	3
WL 303	0	2	0	0	0	0	1	1	0	1	3	0	0	5	0	0	4	0	0	10	0	0	1	0	0	20	0
WL 305	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* 5% level of significance used to compare variety yield and Vernal yield in each test year.

† Data provided by the North Dakota Agricultural Experiment Station.

Table 22. Fall growth habit, disease resistance, and insect resistance characteristics of certified alfalfa varieties under Minnesota conditions

Variety according to winter-hardiness	Certification applicant*	Fall growth† (score)	Bacterial wilt‡ (% res.)	Common leafspot§ (% res.)	Lepto leafspot§ (% res.)	Spring blackstem§ (% res.)	Leafhopper yellowing§ (% res.)
Very winterhardy							
Beaver	Canada Dept. of Agric.	7.4	28	26	8	36	38
Norseman	Barzen of Minneapolis	7.9	34	34	10	27	36
Teton	S. Dakota Agr. Exp. Sta.¶	7.4	17	51	6	30	61
Travois	S. Dakota Agr. Exp. Sta.¶	7.4	42	42	7	44	72
Winterhardy							
ATRA 55	Arnold-Thomas Seed Service ^f	6.0	27	44	33	22	30
Dawson	USDA & Nebraska Agr. Exp. Sta.¶	6.5	16	32	13	22	18
Iroquois	Cornell University¶	6.0	69	44	10	40	26
Ladak	USDA (foreign introduction)	7.5	9	22	7	23	43
Ladak 65	Montana Agr. Exp. Sta.¶	6.0	40	16	4	29	23
Narragansett	Rhode Island Agr. Exp. Sta.	5.9	<1	44	11	44	24
Progress	Caladino Farm Seeds Inc. ^e	5.4	29	18	9	18	39
Ranger	USDA & Nebraska Agr. Exp. Sta.¶	5.4	16	11	1	7	16
Scout	Farmers Forage Res. Coop. ^a	5.8	13	30	9	19	32
Team	USDA	5.4	<1	51	10	38	59
Titan	W. R. Grace & Co. ^d	6.4	68	31	16	60	47
Weevlchek	Farmers Forage Res. Coop. ^a	5.5	64	47	22	38	74
WL 202	Waterman-Loomis Co. ^b	6.0	39	7	12	39	29
WL 215	Waterman-Loomis Co. ^b	6.3	40	23	15	38	23
123	DeKalb Agric. Assoc. Inc.	6.3	46	8	22	39	51
153	DeKalb Agric. Assoc. Inc.	5.7	2	7	5	19	27
520	Arnold-Thomas Seed Service ^f	5.6	45	25	17	42	42
522	Arnold-Thomas Seed Service ^f	5.3	45	15	10	40	30
525	Arnold-Thomas Seed Service ^f	5.7	43	29	24	52	21
Victoria	Arkansas Agr. Exp. Sta.	6.3	5	47	9	43	46
Vernal	Wisconsin Agr. Exp. Sta. & USDA¶	6.5	47	23	14	41	29
Moderately winterhardy							
A24	Embro Seed Co. Inc. ^c	4.2	5	64	3	28	25
A59	E. F. Mangelsdorf & Bros. Inc. ^c	5.0	18	21	12	42	18
Anchor	Rudy-Patrick Co.	5.4	40	58	13	18	13
Apex	W. R. Grace & Co. ^d	4.6	<1	48	10	20	28
Bonus	Cal/West Seeds ^e	4.7	13	17	18	40	45
Cardinal	Northrup King & Co.	3.2	<1	76	11	13	18
DuPuits	Northrup King & Co.	3.0	<1	76	5	21	18
Europa	H. W. Walcott & Co.	3.3	<1	81	12	21	20
Glacier	Northrup King & Co.	4.4	<1	56	16	42	24
Kanza	USDA & Kansas Agr. Exp. Sta.	4.4	72	9	19	28	26
Saranac	Cornell University¶	4.5	55	49	18	37	20
Stride	Caladino Farm Seeds Inc. ^e	3.0	2	58	7	17	31
Tempo	Farmers Forage Res. Coop. ^a	5.1	29	42	11	19	31
Thor	Northrup King & Co.	4.5	78	..	..	..	..
Warrior	Northrup King & Co.	4.3	22	55	12	26	16
WL 303	Waterman-Loomis Co. ^b	4.3	12	22	20	32	37
WL 305	Waterman-Loomis Co. ^b	4.7	25	13	9	47	36

* Sold in Minnesota by: a. Land O'Lakes-Felco, b. Midland Cooperatives, Inc., c. Ramey Seed Co., d. Rudy Patrick Co., e. Peterson Seed Co., f. Pioneer Hi-Bred International, Inc., and g. Seed available from several sources.

† 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 and distributed by Peterson Seed Co. Seed supply very limited.

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

by MacDonald College, Quebec, Canada. Seed supply very limited.

OTHER VARIETIES

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

Table 23. 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

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 in 1937 by MacDonald College, Quebec, Canada and distributed by Maple Leaf Mills Ltd., Toronto, 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.

VARIETIES NOT ADEQUATELY TESTED

Emerson—Local strain from Marion County, Iowa, and released by Iowa Agricultural Experiment Station. Distributed by Peterson Seed Co.

OTHER VARIETIES

Kenland—Very susceptible to northern anthracnose and virus. Released by Kentucky Agricultural Experiment Station in cooperation with U.S. Department of Agriculture.

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

Table 24. 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

Brome grass 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.

Table 25. Dry matter yields of brome grass varieties in tons per acre

Variety	Crookston	Grand Rapids	Lamberton	Morris	Rosemount
No. trial years	2	4	3	1	4
Baylor	2.77	3.73	3.20	3.80	3.53
Fox	2.62	4.05	3.08	4.08	3.48
Lincoln	2.55	3.64	3.00	3.98	3.39
Sac	2.67	3.70	3.03	4.15	3.65
Saratoga	2.69	4.18	3.23	4.26	3.53
LSD 5%	.43	.43	.36	.62	.31

Fox—Spreading, good seedling vigor, good tolerance to leaf diseases. Maturity similar to Lincoln. Released in 1968 by Minnesota Agricultural Experiment Station and distributed by Farmers Union Central Exchange Inc. Limited seed available in 1973.

Lincoln—Spreading, good seedling vigor. Released in 1942 by Nebraska Agricultural Experiment Station in co-

operation 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.

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.

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.

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

Variety	Crookston	Grand Rapids	Lamberton	Morris	Rosemount	Waseca
No. trial years	1	6	2	3	8	1
Frontier	2.55	4.30	2.59	3.01	3.75	3.22
Ioreed	2.68	4.25	2.04*	3.39	3.95	3.15
Rise	2.64	4.35	2.66	3.20	3.83	3.15
LSD 5%	.51	.18	.21	.26	.31	.40

* Data from one trial year.

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.

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

Variety	Arlington Wis.*	Ashland Wis.*	Crookston	Grand Rapids	Morris	Rosemount
No. trial years	2	1	2	6	1	3
Champ	2.56	1.86	—	3.41	—	—
Clair	2.82	1.76	3.66	3.82§	4.56	4.01
Climax	2.64‡	1.81	3.62	3.62§	4.35	3.66
Drummond	2.71	—	3.54	3.38§	—	2.86‡
Essex	2.11	—	3.19	3.46§	—	3.53‡
Itasca	—	—	3.79	3.52	4.49	3.65
Lorain	—	1.80	—	2.98§	4.23	—
Timfor	—	—	—	—	—	3.81‡
Verdant	2.40	1.70	3.60	3.37	—	—
LSD 5%	ns	ns	.71	.18	.59	.26

* Data provided by Wisconsin Agricultural Experiment Station.

† Data from one trial year.

‡ Data from two trial years.

§ Data from three trial years.

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 and distributed by Northern Farm and Garden, Inc.

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

VARIETIES NOT ADEQUATELY TESTED

Champ—Leafy with good aftermath in Canadian trials. Five to seven days earlier in maturity than Climax. Released in 1967 by the Ottawa Research Station, Canada Department of Agriculture.

Timfor—Medium-early very leafy variety relatively free of leaf diseases. Developed in 1971 and distributed by Northrup King and Co.

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.



A timothy variety trial in the foreground and a reed canarygrass trial in the background occupy the attention of agronomist A. Hovin.

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.

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)		1/2-1	
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 1 1/2 bushels of soybeans		10	
Soybeans	60		May 5-25
6- to 7-inch rows		120 (4 seeds/ft.)	
20-inch rows		75 (8 seeds/ft.)	
30-inch rows		60 (10 seeds/ft.)	
40-inch rows		50 (11 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 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	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.