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Varietal Trials

OF FARM CROPS

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VARIETAL TRIALS OF FARM CROPS

MANY VARIETIES of farm crops are available from which the farmer can select those he will plant. These varieties differ widely in yielding ability, maturity, standing ability, quality, disease resistance, and other important characteristics. Successful crop production depends to a considerable extent on whether the farmer selects varieties adapted to his farm.

To provide a basis for the selection of the most desirable varieties, the Minnesota Agricultural Experiment Station annually grows comparative tests of varieties of each of the important farm crops.

Trials are conducted at the University Agricultural Experiment Stations located at St. Paul, Rosemount, Waseca, Morris, Crookston, Grand Rapids, and Duluth; and on farmers' fields in southwestern Minnesota, northern Minnesota, and other locations.

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

On the basis of results from these comparative trials, the list of varieties recommended for use in Minnesota is revised each year. Helping to formulate the list of recommended varieties are staff members from the Departments of Agronomy and Plant Genetics, Plant Pathology and Agricultural Botany, Agricultural Biochemistry, Soils, and Entomology and Economic Zoology; from the Agricultural Extension Service; and from the branch experiment stations.

This bulletin gives brief descriptions of varieties and summarizes yields and other comparative agronomic data on varieties of barley, oats, rye, wheat, flax, soybeans, sunflowers, alfalfa, bromegrass, red clover, biennial sweet clover, birdsfoot trefoil, and field peas —all grown in field plots in 1956.

Usually the number of years of trial varies among varieties within the same crop. For some such tests, adjustment of part of the yields has been made so averages of varieties tested for different numbers of years can be compared directly.

University personnel responsible for the field work at the various locations are: J. R. Thompson and R. E. Hodgson at Waseca; R. L. Thompson and A. W. Edson at Morris; O. C. Soine and B. E. Youngquist at Crookston; C. H. Griffith and W. Matalamaki at Grand Rapids; W. W. Nelson and R. S. Grant at Duluth; and R. G. Robinson at Rosemount and in southwestern Minnesota.

BARLEY

RECOMMENDED VARIETIES

Forrest—Six-rowed, smooth-awned, white aleurone variety. Medium height and maturity. Good straw strength, bushel weight, and kernel size. Medium yielding ability. Recommended at present as "barley." Malting quality not yet established. A single plant selection made at the University of Minnesota from Brandon 1136, which came from (Peatland x Newal) x O.A.C. 21.

Fox—Six-rowed, smooth-awned, light-blue aleurone variety. Medium in height and maturity; medium-to-good strength of straw. At present recommended simply as "barley" with no quality designation. Small-scale malting and brewing tests

have been made but, generally, acceptability will not be known until larger quantities become available. Developed at the University of Wisconsin from crosses involving Barbless, Pillsbury, and Composite cross Selection 12.

Kindred (L)—Six-rowed, rough-awned, white aleurone variety with good malting quality. Yields well and is medium early, but highly susceptible to lodging. Selected by a farmer, S. T. Lykken of Kindred, North Dakota. Recommended as a malting variety in all parts of Minnesota.

Montcalm — Six-rowed, smooth-awned, blue aleurone variety. Yields well and is accepted by a large part of the American malting industry. Tall, rather late-maturing, with mediocre to poor strength of straw. Selected at MacDonald College, Quebec, from the cross (Michigan 31604 x Common Six-Rowed 4307 M. C.) x Mandscheuri 1807 M. C. Recommended as a malting barley in the northwestern and cutover sections of Minnesota.

Peatland—Six-rowed, rough-awned, stiff-strawed, white aleurone variety. Yields better on peat soils than most other varieties. Has also yielded well on mineral soils in northeastern Minnesota; recommended as a feed barley in that section. Has small seeds; not generally acceptable for malting purposes. A Minnesota selection from a variety introduced from Switzerland.

Vantage — Stiff - strawed, six - rowed, smooth-awned feed barley. Has a white aleurone and gives high yields. Developed at Brandon, Manitoba, from a cross (Newal x Peatland) x Plush. Recommended as a feed barley in all sections of Minnesota.

Traill—Six-rowed, rough-awned, white aleurone variety. Medium in maturity and height; has good standing ability. Has given excellent yields in nearly all locations where tested in Minnesota. Rather extensive quality tests have been made, but only on small samples. General acceptability for malting and brewing purposes will depend on trials with larger amounts. Developed at the North Dakota Agricultural Experiment Station from a cross of Kindred x Titan.

VARIETIES NOT ADEQUATELY TESTED

Herta — Two-rowed, rough-awned variety. Has given good yields in Minnesota; matures rather late. Of medium height, with very good straw strength. Like all Minnesota-grown, two-rowed varieties, it is not considered suitable for malting. Originated at the Weibullsholm Plant Breeding Station, Landskrona, Sweden, from a cross of Kenia x Isaria.

Husky—Six-rowed, smooth-awned, white aleurone feed variety. Rather late maturing; of medium height, with good straw strength. In limited trials in Minnesota has given only fair yields. Originated at Saskatoon, Saskatchewan from a cross involving Peatland, Regal, O.A.C. 21, and Newal.

Liberty — A new six-rowed, smooth-awned, white aleurone variety developed at the South Dakota Agricultural Experiment Station. In rod row tests in Minnesota has given high yields. Good straw strength. Medium maturity. Parentage involves Lion, Manchuria, Peatland, and Titan. Malting quality not thoroughly evaluated, though its tendency to produce greyish kernels is not considered desirable. No seed available in Minnesota in 1957.

Parkland — Six-rowed, smooth-awned blue aleurone variety. Medium late. Good straw. Licensed as malting variety in Canada. Fair to good yielding ability. Originated at Brandon, Manitoba from a cross of (Olli x Montcalm) x Brandon 1136.

Rika—A sister selection of Herta; in almost all respects similar.

U.M. 570 — Six-rowed, smooth-awned, mixture of blue and white aleurone kernels. Good straw. Medium late. Fair to good yielding ability. Rejected as malting variety in Canada. Malting quality under consideration in the United States. Developed at the University of Manitoba from the cross (Peatland x Newel) x Montcalm. Never officially released but now grown on considerable acreage in North Dakota.

Vantmore — Six-rowed, smooth-awned, white aleurone feed barley. Has had only limited trial in Minnesota. Medium in maturity and plant height, with good straw strength. Developed at Brandon, Manitoba from Titan x Vantage.

VARIETIES NOT RECOMMENDED

Barbless (Wisconsin Ped. 38)—Six-rowed, smooth-awned, white aleurone variety. Yields well under favorable conditions. Weak-strawed; lodges badly when grown on heavy or fertile soils. Late in maturity. Selected at the Wisconsin Agricultural Experiment Station from Oderbrucker x Lion.

Feebar—High-yielding, stiff-strawed, six-rowed feed barley. Developed for the dry conditions of central and western South Dakota. Selected from the cross Peatland x Vaughn.

Manchuria—A type rather than a single variety. Several selections have been made within the type, including Minnesota 184,

Variety	Years of trial	Southern, central, and western locations: Waseca	Southwestern Minnesota	Rosemount	Morris	Crookston	Average five locations	Northern locations: Grand Rapids	Duluth	Northern Minnesota	Average three locations
					(bushels per acre)						
Barbless	1953-56	44.5	37.4	42.6	**48.5**	44.0	43.4	32.6	33.4	34.3	33.4
Forrest	1953-56	48.4	40.6	40.0	**54.2**	39.9	44.6	33.2	36.2	35.3	34.9
Fox	1955-56	41.8	36.4	39.5	**54.7**	38.3	42.1	29.5	35.3	29.0	31.3
Herta *	1954-56	61.8	45.5	50.4	**61.5**	.....	.....	37.5	41.2	51.3	43.3
Husky	1955-56	48.1	34.7	48.0	**60.7**	41.9	46.7	46.9	30.5	40.2	39.2
Kindred	1953-56	54.5	41.0	41.8	**56.1**	43.4	47.4	31.6	34.7	41.5	35.9
Mars	1953-56	48.5	37.0	35.5	**54.6**	45.7	44.3	26.5	27.3	35.1	29.6
Montcalm	1953-56	48.3	34.2	39.2	**50.6**	40.1	42.5	35.1	34.3	35.1	34.8
Parkland	1955-56	54.8	39.6	43.5	**57.2**	45.0	48.0	36.4	30.1	39.7	38.7
Peatland	1953-56	.....	.....	.....	.....	.....	.....	35.9	39.1	33.6	36.2
Traill	1953-56	64.4	44.2	45.3	**69.2**	48.1	54.2	35.7	37.2	43.9	38.9
U.M. 570	1955-56	49.9	35.4	42.7	**51.8**	.....	.....	38.8	27.1	31.7	32.5
Vantage	1953-56	60.4	41.2	44.5	**60.0**	45.7	50.4	31.4	34.2	38.3	34.6
Vantmore	1955-56	49.0	39.9	48.6	**70.3**	48.7	51.3	22.4	26.6	36.8	28.6
L.S.D. at 5% point †		6.6	3.7	3.8	5.0	5.6	2.3	9.6	9.1	12.4	6.0

† *Applies specifically to varieties occurring the entire period, 1953-56.*

* *Two-rowed variety; the others are six-rowed.*

Table 2. Averages of Barley Varieties for Date of Heading, Plant Height, Lodging Score, Weight of 1,000 Kernels, and Weight per Bushel

Variety	Average, Waseca, Southwestern Minnesota, Rosemount, Morris, and Crookston, 1953-56: Date of heading *	Plant height	Lodging score †	Weight of 1,000 kernels	Weight per bushel	Average, Grand Rapids, Duluth, and Northern Minnesota 1953-56: Date of heading	Plant height	Weight of 1,000 kernels	Weight per bushel
		(inches)		*(grams)*	*(pounds)*		*(inches)*	*(grams)*	*(pounds)*
Barbless	6-24	35	2.6	29.6	42.3	7-7	30	29.4	42.2
Forrest	6-23	33	1.8	30.0	45.3	7-4	28	29.9	45.7
Fox	6-23	32	2.2	28.6	42.6	7-5	29	32.2	43.7
Herta	6-26	28	2.1	30.8	48.1	7-7	29	31.8	48.7
Husky	6-25	33	2.3	28.3	41.9	7-6	30	30.3	44.2
Kindred	6-22	32	2.9	28.2	44.1	7-2	30	31.8	44.3
Mars	6-21	31	1.4	26.1	44.9	7-2	26	26.6	45.3
Montcalm	6-23	35	3.0	27.7	41.8	7-5	32	29.0	42.9
Parkland	6-24	34	2.3	28.3	43.7	7-5	29	30.2	45.5
Peatland	.....	.....	.....	.....	.....	7-5	33	28.4	47.4
Traill	6-22	30	2.0	28.8	45.7	7-3	26	31.5	44.9
U.M. 570	6-25	35	2.5	29.3	42.8	7-4	31	30.6	43.0
Vantage	6-24	31	1.4	30.3	43.4	7-7	27	30.9	43.8
Vantmore	6-24	31	1.7	27.2	43.7	7-5	29	29.8	42.0

* *No date-of-heading data in Southwestern Minnesota, hence values are four-station average.*

† *1 equals excellent standing ability; 5 equals very poor standing ability.*

‡ *Data for Duluth not included.*

Table 3. Reaction of Barley Varieties to Several Diseases.* (1 = resistant; 2 = moderately resistant; 3 = moderately susceptible; 4 = susceptible)

Variety	Stem rust	Leaf rust	Loose smut	Covered smut	Spot blotch	Net blotch	Stripe	Root rot	Scab	Bacterial blight	Powdery mildew	Septoria	Yellow dwarf	False stripe
Barbless	4	3	4	3	4	2	2	4	4	4	4	4	4	4
Feebar	1	3	4	2	3	2	...	3	3	3	..	1	4	4
Forrest	1	3	3	1	3	3	...	3	3	3	4	4	3	2
Fox	1	4	2	1	3	3	...	3	3	3	4	3	4	2
Herta	4	1	3	2	3	3	...	3	3	3	2	3	4	3
Husky	1	3	4	2	4	3	...	3	3	...	4	4	4	4
Kindred (L)	1	3	3	2	3	2	3	3	3	3	3	4	4	4
Liberty	1	4	2	2	3	2	...	3	3	3	4	4	4	4
Manchuria	4	3	3	1	2	2	4	3	3	4	4	4	4	3
Mars	1	4	3	3	3	2	3	3	3	4	3	4	3	4
Montcalm	4	4	4	1	3	2	3	3	3	4	4	4	3	3
Moore	2	3	4	.....	3	4	3	3	3	..	1	3	...	...
OAC 21	4	3	3	.....	2	2	3	3	3	...	4	...	...	..
Parkland	1	4	3	1	3	3	...	3	3	3	4	4	4	2
Peatland	1	4	2	2	2	2	4	2	2	4	4	4	3	4
Plains	1	.....	.....	.....	3	2	...	3	3	...	...	...	...	..
Rika	4	1	4	2	3	3	...	4	..	4	2	4	4	2
Traill	2	4	4	2	3	3	..	2	3	3	4	4	4	4
Tregal	4	3	1	2	3	3	...	3	3	...	..	...	...	..
U.M. 570	1	4	3	2	3	2	...	3	3	3	4	4	3	3
Vantage	1	4	3	3	4	2	...	3	4	3	4	4	4	4
Vantmore	2	3	3	2	3	3	...	3	3	3	4	4	3	4

** Based on infections which in some cases occurred naturally and in others were artifcially introduced. One or several locations may have been involved. When reaction is not reasonably well established, no information is given. Reactions are all subject to change because of changes in prevalence of physiologic races of the causal organisms.*

North Dakota 2121, O.A.C. 21, and Oderbrucker. The type is six-rowed, rough-awned, medium-early, and medium-tall to tall. Kernels may have either blue or white aleurone.

Nearly all Manchuria selections are acceptable for malting. Yields of Manchuria selections tested in Minnesota have been mediocre. It originated in Manchuria but arrived in the United States by several routes.

Mars — Six-rowed, smooth-awned, stiff-strawed, white aleurone variety. Produces plump, well-filled kernels. Early in maturity, with high weight per bushel. Seeds are small and low in diastatic activity; therefore considered undesirable for malting purposes. Parentage includes Lion, Manchuria, and Peatland. Selected at the Minnesota Agriculture Experiment Station.

Moore—Six-rowed, smooth-awned, white aleurone feed variety. Late in maturity; moderately stiff straw; has yielded well in all locations except Crookston. Very susceptible to net blotch. Developed at the Wisconsin Agricultural Experiment Station from crosses involving Lion, Oderbrucker, Chevron, and Olli.

O.A.C. 21—Blue aleurone selection from the Manchuria type. Yields moderately well; has rough awns and weak straw. Has limited acceptance in the American malting trade. Selected at the Ontario Agricultural College.

Plains—Very early, six-rowed, smooth-awned variety. Developed by the South Dakota Agricultural Experiment Station for the plains country of that state. Yields well in Minnesota, but is not acceptable for malting. Straw is short and stiff. Parentage is Peatland x Dryland.

Tregal — Six-rowed, smooth-awned variety. Yields relatively well in Minnesota, but is unsuited for malting purposes. Selected at the North Dakota Agricultural College from a cross of Trebi x Regal.

OATS

RECOMMENDED VARIETIES

Ajax—White grain, tall, medium late in maturity. High in yield; medium in weight per bushel. Standing ability is not as good as other recommended varieties, except Branch. Susceptible to crown rust, smut, and race 8 of stem rust; resistant to stem rust race 7. Developed in Canada from the cross Victory x Hajira.

Andrew — Yellow grain, medium in height, very early maturing, good yielding oat, with excellent adaptability throughout the Corn Belt. Good weight per bushel; desirable straw strength; low hull percentage. Resistant to smut and race 7 of stem rust; susceptible to stem rust race 8 and crown rust. Selected at the Minnesota Agricultural Experiment Station from a cross of Bond x Rainbow.

Branch—Tall, white oat; late in maturity, and high in yield. Lodges somewhat more than other recommended varieties. Hull percentage is relatively high. Resistant to smut and race 7 of stem rust; susceptible to race 8. Has shown some tolerance to crown rust in the field. Developed in Wisconsin from the cross (Forward x Victoria—Richland) x Forward.

Garry—Developed some years ago in Canada from a cross of Victory x (Victoria x Hajira-Banner). Reselected for purity of agronomic characters and disease resistance. Tall, late, and outstanding in yield, with large yellowish-white seed of good test weight. Resistant to all races of stem rust, including race 7A; has some tolerance to crown rust. Also resistant to the smuts.

Minhafer—Developed at the Minnesota Agricultural Experiment Station from a cross of Landhafer x (Bond-Rainbow x Hajira-Joanette). Yellow grain, similar to Andrew in height and maturity. Somewhat higher in yield than Andrew and superior to it in straw strength, grain size and test weight. Resistant to all races of stem rust including 7A, all races of crown rust prevalent in North America, and smuts.

Minland—Developed at the Minnesota Agricultural Experiment Station from a cross of Landhafer x (Mindo x Hajira-Joanette). Resistant to all races of crown rust prevalent in North America, all races of stem rust except 7A, and smuts. Light-brownish grain; similar to Andrew in maturity, height, yield, and hull percentage. Standing ability is somewhat superior to that of Andrew. Test weight is lower than other recommended varieties.

Rodney—Tall, very late and outstanding in yield. Large, plump, yellowish-white seed of high test weight. Resistant to all stem rust races except 7A and to the smuts; moderately susceptible to crown rust. Developed in Canada from a cross [(Victoria x Hajira-Banner) x (Victory x Hajira)] x Roxton.

Sauk—Tall, late-maturing, high-yielding, somewhat susceptible to lodging. Large, yellow seed of good test weight. Resistant to race 7 of stem rust and the smuts; susceptible to race 8. Has shown some tolerance to crown rust. Developed in Wisconsin from the cross (Forward x Victoria-Richland) x Andrew.

VARIETIES NOT ADEQUATELY TESTED

Beedee — Developed from Beacon x Hawkeye-Victoria by the Wisconsin Agricultural Experiment Station. Medium in maturity, height and lodging resistance. Large brownish-white grain of medium test weight. Resistant to race 7 of stem rust and smuts; susceptible to stem rust race 8 and moderately susceptible to crown rust.

Bentland—Tall, medium-maturing, yellow oat. Resistant to all prevalent races of crown rust, to race 8 of stem rust, and smuts. Susceptible to race 7 of stem rust. Selected from a cross of Benton x Landhafer backcrossed to Benton six times at the Indiana Agricultural Experiment Station.

Burnett—Yellowish-white; large, plump grain of good test weight. Medium in height and maturity; and good in straw strength. Resistant to all races of stem rust except 7A and to smuts; moderately susceptible to crown rust. Developed at the Iowa Agricultural Experiment Station from a cross of Victoria-Hajira-Banner x Colo.

Clarion—Medium-tall and medium-maturing with large, yellow seed of high test weight. Resistant to race 7 of stem rust and to smuts; susceptible to race 8 and crown rust. Selected in Iowa from the cross Clinton x Marion; released in several New England states in 1953.

Fayette—Early yellow oat; medium in height, standing ability, and test weight. Selected from a cross of Vicland x (Branch x Clinton^2-Santa Fe) by the Wisconsin Agricultural Experiment Station. Resistant to all races of crown rust prevalent in North America, to race 7 of stem rust, and to smuts; susceptible to stem rust race 8.

Logan—Selected at the Illinois Agricultural Experiment Station from Benton x Marion. Early, brownish-yellow oat. Medium in plant height, straw strength, and test weight. Resistant to race 7 of stem rust and smuts; susceptible to crown rust and race 8 of stem rust.

Newton—Brownish-yellow oat, medium in height and maturity. Selected from a cross of Nemaha x (Clinton x Boone-Cartier) at the Indiana Agricultural Experiment Station. Resistant to race 7 of stem rust and smuts; susceptible to race 8 and moderately susceptible to crown rust.

Putnam—Early, brownish-yellow oat of medium height. Good kernel size and test weight. Resistant to race 8 of stem rust and smuts; susceptbile to race 7 of stem rust and crown rust. Selected from a cross of Boone-Cartier x Clinton at the Indiana Agricultural Experiment Station.

Ransom—Medium height and early maturity with yellow, medium-sized grain. Resistant to all races of stem rust and smuts; moderately susceptible to crown rust. Developed by the North Dakota Agriculture Experiment Station from a cross of Sac x Hajira-Joanette.

Scotian—Tall, late, good yielding, yellowish-white oat developed in Canada from a cross of Erban x Vanguard. Resistant to race 7 of stem rust; susceptible to crown rust, smuts, and stem rust race 8.

Simcoe—Tall, medium maturing, and good yielding, with large yellowish-white seed of medium test weight. Resistant to race 7 of stem rust; susceptible to stem rust race 8, crown rust, and the smuts. Developed in Canada from a cross of Ajax x Erban.

Vicar—Good yielding, hull-less oat developed at the Cereal Breeding Laboratory in Winnipeg, Canada from a hull-less plant selected in Garry oat field by G. McVicar of Manitoba. Tall, good-strawed, late variety, with the same disease resistance as Garry.

VARIETIES NOT RECOMMENDED

Abegweit—Tall, weak-strawed, late variety. Large white grain of low test weight. Resistant to race 7 of stem rust; susceptible to race 8 and to crown rust and smut. Selected in Canada from Erban x Vanguard.

Benton—Tall and medium maturing. Same resistance to diseases as Clinton, and yields less in Minnesota than recommended varieties. Produced from a cross of D69 x Bond at the Iowa Station; increased in Illinois and Indiana.

Bonda — Relatively tall, good-strawed, and medium-early maturing, with a large yellowish-white grain of superior bushel weight. Low in yield in recent years since the prevalence of race 7 of stem rust to which it is susceptible. Also susceptible to crown rust. Resistant to smut and to race 8 of stem rust. Selected at the Minnesota Agricultural Experiment Station from a cross of Bond x Anthony.

Bonham—Early; medium in height, lodging resistance, and test weight. Yields less

Table 4. Average Yields of Oats

Variety	Years of trial	Rose-mount	Waseca *	Morris	Crook-ston	Grand Rapids	Duluth	South-western Minnesota	Northern Minnesota†	Adjusted Grand Average	1956‡ Average 8 locations	1952-56§ Average 4 locations
						(bushels per acre)						
Gopher	1953-56	50.6	72.6	70.6	68.6	43.1	55.4	48.0	69.6	59.8	59.7	.....
Bonda	1953-56	50.4	68.1	60.3	62.9	40.6	48.5	42.7	55.1	53.6	44.4	.....
Andrew	1953-56	56.5	77.9	71.8	74.1	52.3	59.9	56.2	79.7	66.1	56.2	70.2
Ajax	1953-56	62.4	87.1	79.9	76.5	66.1	64.6	60.1	93.4	73.8	72.7	.....
Branch	1953-56	60.7	87.8	82.0	83.3	65.5	72.4	56.9	90.1	74.8	80.2	.....
Mo. 0-205	1953-56	56.6	76.4	76.3	82.8	49.7	62.0	52.8	68.7	65.7	53.8	.....
Sauk	1953-56	65.3	90.7	87.9	86.3	69.0	67.6	54.6	87.9	76.2	76.0	.....
Rodney	1954-56	59.5	86.7	89.2	86.1	74.8	77.7	61.3	109.3	80.6	83.1	.....
Garry	1955-56	70.3	99.5	103.5	98.8	80.9	83.9	69.3	117.9	90.5	85.1	.....
Minland	1955-56	45.2	72.4	68.1	74.6	51.5	55.0	56.0	68.6	61.4	54.5	.....
Simcoe	1956	66.8	86.0	90.4	103.1	74.6	77.3	58.3	91.4	81.0	77.2	.....
Ransom	1956	49.5	55.0	55.6	64.5	51.0	55.7	45.3	46.4	52.9	49.1	.....
Minhafer	1956	49.8	73.3	67.9	57.8	42.4	61.7	50.1	52.0	56.9	53.1	73.2
L.S.D. at 5% point ‖		4.7	5.9	6.8	8.6	7.0	7.5	4.6	12.2	2.7	6.2	2.7

* *No data available in 1953.*

† *No data available in 1955.*

‡ *Early spring drouth in 1956 followed by abundant moisture later in the season appeared to affect certain varieties more seriously than others, in comparison with their performance based on previous years of test.*

§ *Averages of rod row yield trials at 4 locations, namely; University Farm, Waseca, Morris, and Crookston, in 1952-56 where 43 comparisons of Minhafer with Andrew were made, indicate a higher yield for Minhafer than Andrew.*

‖ *Applies only to comparison between varieties grown for the entire period.*

than recommended varieties. Resistant to race 8 of stem rust. A mass selection made in Michigan from C.I. 3664, a cross of Bond x D69; it has been increased and distributed by the Michigan Station.

Cherokee—Early and short, fair in test weight. Inferior to recommended varieties in yield. Susceptible to crown rust and race 7 of stem rust; resistant to race 8. Selected from a cross of D69 x Bond. It has been increased in Iowa and Kansas. Also grown under the names Ames No. 2, McCarthy, or 3846.

Clintafe—Taller and later in maturity than Clinton. Resistant to all prevalent races of crown rust, race 8 of stem rust, and smuts; susceptible to race 7. Lower in yield and in bushel weight than Clinton. Developed at the Iowa Agricultural Experiment Station from a cross of Clinton x Santa Fe, backcrossed three times to Clinton.

Clintland—Similar to Clinton in most characteristics, but has resistance to all prevalent North American races of crown rust. Developed in Indiana from the cross Clinton x Landhafer, backcrossed three times to Clinton.

Clinton—Yellow-grained and early maturing. Medium in weight per bushel and plant height; relatively low in hull percentage. Inferior in yield since the prevalence of race 7 of stem rust to which it is susceptible; also susceptible to crown rust. weight. Susceptible to crown rust and race 7 of stem rust; resistant to race 8.

Craig—Medium-tall and late, with large, white seed of medium test weight. In Minnesota trials has been low in yield. Susceptible to both races 7 and 8 of stem rust and to crown rust; resistant to smuts. Developed in New York from the cross Ithacan x Victoria.

Gopher—White-grained, medium-maturing variety selected as a pure line from Sixty Day at the Minnesota Agricultural Experiment Station. Susceptible to stem rust, crown rust, and the smuts.

Jackson—Developed from a cross of Clinton x Marion by the Michigan Agricultural Experiment Station. Resistant to race 7 of stem rust and smuts; susceptible to stem rust race 8 and crown rust. Somewhat lower in yield than the recommended varieties. Medium in height and maturity, with good standing ability.

James—A hull-less variety with good standing ability. Medium in plant height and maturity, with relatively low yielding ability. Resistant to smut and to race 8 of stem rust; susceptible to race 7 of stem rust and to crown rust. Selected in South Dakota from the cross (Bond-Double Cross B) x Nakota.

LaSalle—Early in maturity and medium in height. Low in yield. Resistant to smut and race 8 of stem rust; susceptible to race

Table 5. Average Date of Heading, Plant Height, Weight per Bushel, Hull Percentage, Weight of 200 Kernels, and Standing Ability at Five Locations *

Variety	Date of heading	Plant height	Weight per bushel	Hull	Weight of 200 kernels	Standing ability†
		(inches)	*(pounds)*	*(percent)*	*(grams)*	
Gopher	June 23	36	31.2	33.1	4.4	2.5
Bonda	June 21	38	34.0	33.3	5.5	2.6
Andrew	June 18	36	34.5	27.4	5.3	2.3
Ajax	June 25	42	32.7	32.5	5.0	2.6
Branch	June 27	42	33.3	33.5	4.9	2.8
Mo. 0-205	June 20	38	35.0	27.6	4.4	2.5
Sauk	June 25	38	32.7	31.1	5.4	2.4
Rodney	June 28	41	33.9	32.3	5.4	2.3
Garry	June 26	43	34.1	32.0	5.5	2.0
Minland	June 17	38	29.9	29.8	5.2	2.2
Simcoe	June 23	41	33.5	30.8	5.1	2.6
Ransom	June 19	37	34.5	29.2	5.2	2.0
Minhafer	June 20	37	34.8	31.0	5.4	2.0

* *Rosemount, Waseca, Morris, Crookston, and Southwestern Minnesota.*

† *Standing ability ratings: 1-5; 1 = excellent, and 5 = very poor.*

Resistant to smut and race 8 of stem rust. Selected at the Iowa Agricultural Experiment Station from a cross of D69 x Bond.

Colo—Developed from a cross of Hancock x Morota-Bond. Inferior in yield to recommended varieties in Minnesota. Medium in maturity, plant height, and test 7 and to crown rust. Selected in Illinois from the cross Clinton x Marion.

Mo. 0-205—Grayish-red oat, medium in yield, with good straw strength, low hull percentage, and high test weight. Medium-early in maturity. Resistant to smut and to race 7 of stem rust; susceptible to race

8. Has shown some tolerance to crown rust in the field. Developed in Missouri from the cross Columbia x Victoria-Richland.

Mindo—Very early, yellow oat with good weight per bushel. Short straw; good resistance to lodging. Inferior in yield since the prevalence of race 7 of stem rust to which it is susceptible. Also susceptible to crown rust; resistant to smut and race 8 of stem rust. More susceptible to 2,4-D than other varieties tested. Selected at the Minnesota Agricultural Experiment Station from a cross of Bond x [(Minota x White Russian) x Black Mesdag].

Nemaha—Almost identical to Cherokee; likewise inferior in yield to recommended varieties. Developed at Iowa from the cross Victoria-Richland x (Morota x Bond).

Shelby—Yellowish-white grain; medium late in maturity. Extreme susceptibility to race 7 of stem rust has caused a serious reduction in yield in the past few years. Resistant to race 8 of stem rust and smut; susceptible to crown rust. Selected in Iowa from a cross Anthony x Bond.

Waubay—Medium in plant height and maturity, with large yellow seed of high test weight. Good lodging resistance. Somewhat lower in yield than the recommended varieties. Resistant to race 7 of stem rust and smuts, but susceptible to crown rust and race 8 of stem rust. Developed in South Dakota from a cross of Clinton x Marion.

WINTER RYE

RECOMMENDED VARIETIES

Adams — High yielding, winter-hardy, medium in maturity, and tall. Medium-size seed, light brown in color, and high in bushel weight. A combination of lines from Imperial which were selected for high fertility. Released by the University of Wisconsin in 1953.

Caribou—High yielding, very winter-hardy, medium in maturity, and tall. Small seed, somewhat mixed in color, and high in bushel weight. Selected from Crown rye by the University of Saskatchewan; increased and released by the University of Minnesota in 1953.

VARIETIES NOT ADEQUATELY TESTED

Dominant—High yielding, fair in winterhardiness, late-maturing, and medium in height. Good resistance to lodging. Medium-size seed, predominantly green in color, and medium in bushel weight. Originated in Holland from a cross of Lochow's Short-Straw x Brandt's Marien.

King's II—High yielding, fair in winterhardiness, late-maturing, and medium in height. Good resistance to lodging. Small, light-brown seed of low bushel weight. Originated in Sweden from a selection of Star rye.

Sangaste—Medium in yield, winter-hardy, late-maturing, and tall. Good resistance to lodging. High in fall forage growth. Medium-size seed, mixed in color, and medium in bushel weight. Originated in Esthonia; introduced into Canada by Rene Berg, grandson of original breeder.

Von Rumker—High yielding, fair in winterhardiness, late-maturing, and tall. Good resistance to lodging. Medium-size seed, green in color, and low in bushel weight. Originated in northern Germany.

VARIETIES NOT RECOMMENDED

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

Emerald—Medium in yield, very winter-hardy, medium in maturity, and tall. Sometimes lodges badly. Small seed, green in color, and medium in bushel weight. Developed at the University of Minnesota by selecting green-colored seed in self-pollinated lines and their combinations.

German—Low-yielding, fair in winter-hardiness, medium in maturity, and tall. Medium-size seed, green in color, and medium in bushel weight. Originated in Germany.

Imperial—Appears identical to Adams, except has yielded less in Minnesota and Wisconsin trials. Originated at the University of Wisconsin.

Pierre—Medium in yield, very winter-hardy, early-maturing, and tall. Good resistance to lodging. Small seed, mixed in color, and high in bushel weight. A recombination of inbred lines from a population of Dakold and Swedish origin; released by South Dakota State College in 1950.

Tetra Petkus—High yielding if there is no winter injury. But in most trials has been winterkilled or injured so badly that

Table 6. Average Adjusted Yields of Winter Rye

Variety	St. Paul		Sandy soil*		Southwestern Minnesota		Morris		Grand Rapids		Adjusted average
	Years of trial	Yield per acre	Years of trial	Yield per acre	Years of trial	Yield per acre	Years of trial	Yield per acre	Years of trial	Yield per acre	Yield per acre
		(bushels)		*(bushels)*		*(bushels)*		*(bushels)*		*(bushels)*	*(bushels)*
Adams	1951-56	34.4	1951-55	22.3	1953-56	33.9	1953-56	41.3	1953-56	48.6	36.1
Caribou	1950-56	35.7	1950-55	22.2	1953-56	34.7	1953-56	41.8	1953-56	49.6	36.8
Antelope	1950-56	34.5	1950-55	23.1	1953-56	32.6	1953-56	41.9	1953-56	47.0	35.8
Dominant	1953-54, 56	30.5	1953-55	23.5	1955-56	33.4	1956	47.9	1956	55.7	38.2
Emerald	1950-56	33.9	1950-55	21.0	1953-56	30.6	1953-56	39.2	1953-56	42.9	33.5
German	1953-56	26.8	1953-55	19.0	1954-56	31.4	1954-56	38.5	1955-56	42.2	31.6
King's II	1950-51, 53-56	33.1	1953-55	19.6	1955-56	32.2	1955-56	45.1	1955-56	52.1	36.4
Sangaste	1952-54, 56	32.5	1952-54	21.6	1956	28.1	1956	35.7	1956	58.6	35.3
Tetra Petkus	1953-56	16.9	1953-55	9.7	1953-56	12.3	1953-56	19.5	1953-56	32.6	18.2
Von Rumker	1954-56	28.2	1954-55	21.8	1954-56	33.2	1955-56	41.4	1955-56	56.1	36.1
L.S.D. at 5% point		2.5		2.3		4.5		4.2		6.4	1.9
Non-replicated plots at least 100 feet from any other rye variety											
Tetra Petkus	1953-56	28.6	.....	.....	1953-56	25.6	1953-56	39.8	1953-56	38.5	29.6
Tetra Petkus (adjusted yield†	1953-56	33.5	.....	.....	1953-56	24.7	1953-56	32.6	1953-56	49.7	31.6

** 1950 Stearns County, 1951-55 Anoka County.*

† Winter wheat was sown next to the rye variety plots and next to the isolated Tetra Petkus plots. The adjustment consisted of proportionately increasing the yield of Tetra Petkus if the winter wheat next to it yielded less than the winter wheat next to the variety trials and proportionately decreasing its yield if the adjacent winter wheat yielded more than that next to the variety trials.

yield is low or medium. Very late-maturing and very low in bushel weight. Seed is very large and uniformly greenish-gray in color. Excellent lodging resistance. For maximum yield, must be grown isolated from other rye varieties; pollen from other rye will reduce the seed set of Tetra Petkus and vice versa. Originated in Germany as a result of increasing the number of chromosomes in the Petkus variety from fourteen to twenty-eight by using the chemical colchicine.

Table 7. Adjusted Averages of Winter Rye Varieties at Five Locations for Winterkilling, Date Mature, Plant Height, Lodging Score, Kernel Weight, and Bushel Weight

Variety	Winter-killing*	Date mature	Plant height	Lodging score†	Weight of 100 kernels	Bushel weight
	(percent)		*(inches)*		*(grams)*	*(pounds)*
Adams	4	July 18	49	2.2	2.5	55.1
Caribou	2	July 17	46	2.3	2.2	55.3
Antelope	1	July 18	46	2.4	2.3	55.1
Dominant	35	July 19	43	1.9	2.7	54.6
Emerald	2	July 17	48	2.3	2.3	55.0
German	21	July 18	47	2.4	2.6	54.2
King's II	23	July 20	42	1.6	2.3	53.5
Sangaste	6	July 19	51	2.2	2.6	54.2
Tetra Petkus	47	July 23	46	1.3	4.1	50.5
Von Rumker	28	July 20	46	2.0	2.7	53.4
Non-replicated plots at least 100 feet from any other rye variety						
Tetra Petkus	28	July 23	47	1.5	4.0	51.7

** Average of 10 trials at 5 locations in which some winterkilling occurred.*
† 1.0 erect, 5.0 flat.

SPRING WHEAT

RECOMMENDED VARIETIES

BREAD

Lee—Early, bearded, resistant to leaf rust; susceptible to bunt, to loose smut and race 15B of stem rust. Short, medium-strength straw. Good test weight; satisfactory milling and baking characters. Selected from a cross of Hope x Timstein made by the Minnesota Agricultural Experiment Station in cooperation with the U. S. Department of Agriculture.

Selkirk—Awnless variety of medium height, maturity, and straw strength. Moderately resistant to leaf rust and stem rust, including race 15B. High-yielding, with a good bushel weight; satisfactory milling and baking qualities. Selected from a cross of McMurachy-Exchange x Redman[3] made at the Dominion Laboratory of Cereal Breeding, Winnipeg.

DURUM

West Central and Northwestern Sections

Langdon—Early, bearded variety of medium height and straw strength. Moderately resistant to leaf rust and resistant to stem rust, bunt and loose smut. Has a good yield and test weight; appears satisfactory for use in making semolina products. Selected from a cross of (Carleton x Ld. 194-Khapli x Ld. 308) x Stewart made at the North Dakota Agricultural Experiment Station.

Ramsey—Bearded variety, medium in maturity and height. Resistant to leaf rust, loose smut and bunt. Moderately resistant to stem rust. Straw is somewhat weak. Lower in yield than Langdon; equal to it in quality. Selected from Carleton x P. I. 94701 at the North Dakota Experiment Station.

VARIETIES NOT ADEQUATELY TESTED

BREAD

Conley—Late-maturing, bearded variety of medium height and fair straw strength. Resistant to stem rust; moderately susceptible to leaf rust. Seriously injured by glume and stem-blackening in 1955, reducing yield and bushel weight. Milling and baking qualities are satisfactory. Selected from a cross of [Thatcher x (McMurachy-Exchange x Redman[5])] x Lee at the North Dakota Experimental Station.

Russell—A bearded, high-yielding wheat recommended as a feed wheat in Wisconsin. It is resistant to mildew and Hessian

Table 8. Average Adjusted Yields of Spring Wheat

Variety	Years of trial	Rosemount	Waseca	Morris	Crookston	Average M. & C.	Southwest	Grand Rapids	Duluth	Northern Minnesota*
					(bushels per acre)					
BREAD WHEATS										
Thatcher	1950-56	16.8	19.8	27.0	25.6	26.3	17.6	.....	.....	.....
Mida	1950-56	18.6	21.4	26.6	26.4	26.5	17.9	22.9	19.3	20.6
Henry	1950-56	26.5	28.2	35.1	33.5	34.3	22.0	29.9	26.5	28.0
Lee	1950-56	23.6	26.6	33.6	29.8	31.7	22.4	28.7	23.9	24.1
Rushmore	1950-56	21.4	24.4	30.5	28.0	29.3	20.6	25.8	23.0	22.6
Selkirk	1953-56	31.9	32.1	42.4	39.9	41.2	30.1	33.6	32.2	33.8
Conley	1955-56	22.4	24.7	34.0	29.7	31.9	24.4	28.8	21.3†	28.9
Russell	1956	28.3	28.4	33.4	34.5	34.0	23.9	35.2	32.4	35.8
DURUMS										
Mindum	1950-56	18.0		25.9	28.9‡	27.4				
Sentry	1953-56	17.8		34.2	30.0	32.1				
Yuma	1955-56	17.5		29.2	26.2	27.7				
Ramsey	1955-56	21.5		31.2	30.0	30.6				
Towner	1955-56	22.8		28.7	26.9	27.8				
Langdon	1955-56	20.8		38.0	41.9	40.0				
L.S.D. at 5% point		1.9	2.5	2.3	2.6	1.7	1.6	2.4	2.4	2.5

* *No data obtained in 1955.*

† *1956 only.*

‡ *No data obtained in 1954.*

fly, susceptible to stem and leaf rust and resistant to bunt. It is one-half a day later than Henry, is taller and has a weaker straw. This variety is only fair in milling and baking. It is a selection from a cross of Thatcher x W38-Hope made in Wisconsin.

DURUM

Towner — Bearded, late-maturing, tall, with slightly weak straw. Resistant to leaf rust, stem rust, and bunt. Showed a medium yield and good test weight in preliminary trials. Quality appears to be satisfactory. Selected from a cross of Carleton x P. I. 94701 at the North Dakota Experiment Station.

Yuma—Short, bearded, average in maturity, and low in yield. Resistant to leaf rust, stem rust, and bunt. Quality appears to be satisfactory in the preliminary test. Selected from a cross of Ld. 194-Khapli x Ld. 308; developed at the North Dakota Experiment Station.

Table 9. Adjusted Averages for Spring Wheat Varieties for Date of Heading, Plant Height and Weight Per Bushel

Variety	Date of heading*	Plant height	Weight per bushel
		(inches)	*(pounds)*
BREAD WHEATS			
Thatcher	6-26	35	53.2
Mida	6-27	38	55.1
Henry	6-27	39	54.9
Lee	6-26	33	55.8
Rushmore	6-25	35	55.7
Selkirk	6-27	35	57.1
Conley	7-1	38	54.7
Russell	6-28	41	55.2
DURUMS*			
Mindum	7-2	45	54.0
Sentry	6-27	37	57.4
Yuma	6-30	37	55.4
Ramsey	6-30	40	56.2
Towner	7-1	45	58.4
Langdon	6-29	40	56.7

** Average of Rosemount, Morris, and Crookston.*

VARIETIES NOT RECOMMENDED

(All of these varieties are susceptible to stem rust race 15B, but many of them are resistant to other races)

BREAD

Henry—Bearded variety developed by the Wisconsin Agricultural Experiment Station. Good yielding, moderately susceptible to bunt and susceptible to scab. Unsatisfactory in milling and baking characters.

Mida—Bearded, medium in maturity and strength of straw. Moderately susceptible to bunt and leaf rust; susceptible to scab, loose smut, and stem rust. Satisfactory milling and baking characters. Selected from a cross of (Ceres-Double Cross) x (Ceres-Hope-Florence) at the North Dakota Experiment Station.

Redman—Awnless variety, susceptible to leaf rust and stem rust. Inferior in yield to recommended varieties. Selected from a cross of Canus x Regent made at the Dominion Laboratory of Cereal Breeding, Winnipeg, Canada.

Rival—Bearded variety, susceptible to leaf rust and stem rust. Resistant to bunt and moderately resistant to loose smut; moderately susceptible to scab; susceptible to black chaff. Straw is somewhat weaker than Thatcher; tends to shatter. Higher in test weight than Thatcher; about equal in milling and baking qualities. Selected from a cross of Ceres x (Hope-Florence) at the North Dakota Experiment Station.

Rushmore—Early, awnless variety that has yielded less than Lee. Susceptible to leaf rust and stem rust. Moderately resistant to bunt and loose smut. Good test weight and milling and baking qualities. Selected from a cross of Rival x Thatcher by the South Dakota Agricultural Experiment Station.

Spinkcota—Bearded; susceptible to leaf rust, stem rust, and bunt; inferior milling and baking qualities. A selection of Velvet Chaff or Preston developed by a South Dakota farmer.

Thatcher—Beardless and strong-strawed. Very susceptible to leaf rust, stem rust, and scab, but has high milling and baking qualities.

DURUM

Carleton — Bearded, amber-kerneled, strong-strawed, somewhat lower yielding than Mindum. Resistant to leaf rust; moderately susceptible to bunt and loose smut; susceptible to scab and stem rust. About equal to Mindum in quality for semolina products. Selected from a Mindum x Vernal Emmer backcross made by the U. S. Department of Agriculture in cooperation with the North Dakota Experiment Station.

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

Stewart—Bearded and amber-kerneled. Resistant to leaf rust, bunt and loose smut; susceptible to scab and stem rust. Weaker

strawed than Carleton. Equal to Mindum in quality for semolina products. Selected from a Mindum x Vernal Emmer backcross made by the U. S. Department of Agriculture in cooperation with the North Dakota Experiment Station.

Vernum—A bearded variety resistant to leaf rust, bunt and loose smut; susceptible to stem rust and scab. Not equal to Carleton and Stewart in quality for semolina products. A selection from Mindum x Vernal Emmer backcrossed to Mindum, developed cooperatively by the U. S. Department of Agriculture and the North Dakota Experiment Station.

Sentry—A selection from LD. 308 x Nugget, made at the North Dakota Experiment Station. Moderately susceptible to stem rust but appears to have tolerance to it, which allows good yield and grain quality. Resistant to leaf rust, bunt and loose smut. Preliminary tests show it to be satisfactory for use in making semolina products.

WINTER WHEAT

RECOMMENDED VARIETIES

(All winter wheat varieties are susceptible to stem rust race 15B)

Minter—Bearded, white-chaffed winter wheat. Equal to Minturki in winterhardiness, slightly better in yielding ability. Susceptible to leaf and stem rust. Somewhat higher weight per bushel, whiter crumb color, and lower pigment content than Minturki. A selection from a backcross of (Hope x Minturki) x Minturki, developed by the Minnesota Agricultural Experiment Station.

Minturki—Bearded, white-chaffed, stiff-strawed variety. Early maturing; yields well. Moderately resistant to bunt, loose smut, and fusarial head blight. Susceptible to leaf and stem rust. Very winterhardy, but not as reliable on sandy lands as winter rye. Selected from a cross of Turkey x Odessa by the Minnesota Agricultural Experiment Station.

VARIETIES NOT RECOMMENDED

Blackhawk—Bearded variety of good quality. Susceptible to stem rust and resistant to leaf rust. Less winterhardy than Minturki or Minter; yields less than either when winter injury is severe. A selection of a Fultz x Minturki cross developed by the Wisconsin Agricultural Experiment Station.

Iohardi—Bearded variety, released to Iowa farmers in the fall of 1948. Susceptible to leaf and stem rust. A selection from an Iobred x Minhardi cross developed at the Iowa Agricultural Experiment Station.

Table 10. Average Yield of Winter Wheat

Variety	Years of trial*	St. Paul	Waseca	Grand Rapids	Average, three locations	Years of trial*	Southwestern Minnesota
		(bushels per acre)					
Minturki	1943-56	32.1	24.6	32.5	29.7	1950-56	16.3
Minter	1943-56	33.8	26.6	34.4	31.6	1950-56	20.0
Blackhawk	1943-56	33.0	25.4	30.7	29.7	1950-56	17.1

** Crops failed at St. Paul 1943, 1944, 1948, 1954.*
Waseca 1948, 1954.
Grand Rapids 1943, 1944, 1946.
No trials conducted in 1955.

Table 11. Average Date of Heading, Plant Height, Winter Injury and Weight per Bushel for Winter Wheat

Variety	Date headed	Height	Winter injury	Bushel weight
		(inches)	*(percent)*	*(pounds)*
Minturki	June 20	38	35	58.4
Minter	June 19	36	34	59.8
Blackhawk	June 20	39	37	58.9

FLAX

Carefully conducted experiments have shown that all flax varieties tend to yield higher when sown as soon as the danger of killing frost is past. For this reason an attempt is made to sow all flax yield trials at an early date at each station. This early sowing usually favors the late maturing varieties, so such varieties as Redwood and B5128 probably had an advantage over Marine, an early maturing variety.

RECOMMENDED VARIETIES

ALL SECTIONS

B5128 — Brown-seeded, blue-flowered, late-maturing variety. From a cross of Golden x Rio made at the North Dakota Agricultural Experiment Station. Immune to races of rust found in Minnesota; moderately susceptible to both wilt and pasmo. For best results it should be sown early. Good oil content, of only fair quality. Contains a mixture of types, including a small percentage of both yellow-seeded plants and rust-susceptible plants.

Bolley — Brown-seeded, blue-flowered, medium-early maturity. Originated from a cross of two experimental varieties at the North Dakota Agricultural Experiment Station. Immune to races of rust found in Minnesota; moderately wilt resistant; and moderately susceptible to pasmo. Good yields in field trials; excellent oil content of excellent quality. It is expected this variety will be superior to B5128 or Redwood for late sowing.

Marine — Brown-seeded, blue-flowered, early-maturing flax. Selected from a cross of C.I. 975 x Sheyenne at the North Dakota Agricultural Experiment Station. Immune to races of rust found in Minnesota; resistant to wilt; moderately resistant to pasmo. Has not yielded as well as Redwood or B5128 when sown early, but in late sowings seems superior in yield to both. Fairly good oil content; oil is of high quality. Recommended for sowing wherever an early-maturing, disease-resistant variety is desired.

Redwood—Brown-seeded, blue-flowered variety. Originated from a cross made in 1941 of B5128 x Redson at the Minnesota Agricultural Experiment Station. Mid-late in maturity, immune to races of rust found in Minnesota, moderately wilt resistant, and moderately susceptible to pasmo. Excellent yields in field trials; good oil content of good quality. Straw of excellent fiber quality.

VARIETIES NOT RECOMMENDED

B. Golden—Yellow-seeded variety with pink flowers that fade to white on exposure to light. Moderately susceptible to wilt. Immune to races of rust common to the United States; very susceptible to pasmo. High in oil content; oil is of good drying quality. Not recommended because of susceptibility to pasmo, and because short straw limits its ability to compete with weeds and causes some difficulty in harvesting. Developed at the North Dakota Agricultural Experiment Station.

Bison—Susceptible to rust but has yielded well in the Red River Valley in years when rust was not severe. Resistant to wilt; moderately susceptible to pasmo. High in oil content, low in oil quality. Developed at the North Dakota Station by plant selection. Brown seeds and blue flowers.

Crystal—Developed by the Minnesota Agricultural Experiment Station. It has been difficult at times to obtain good stands of Crystal. Immune to races of rust found in Minnesota; moderately resistant to pasmo; susceptible to late wilt. Seeds are yellow, with high oil content of good quality; flowers are white.

Dakota—Not recommended because it is susceptible to races of rust now prevalent in Minnesota. A selection from a cross of Renew x Bison first introduced in North Dakota. Brown seeds and blue flowers.

De Oro—Developed at the North Dakota Experiment Station as a selection from B. Golden. Appears to have medium yielding ability. Late in maturity; medium tall, with yellow seeds of medium size. Flowers are pink. Immune to races of rust found in Minnesota; moderately resistant to wilt; very susceptible to pasmo.

Koto — Brown-seeded, high-yielding, mid-late in maturity. Resistant to wilt; moderately susceptible to pasmo; susceptible to races of rust common in Minnesota. Distinguished from Redwing by characteristic dark blue flowers. Medium-sized seed of satisfactory oil content and quality. A selection from a cross of (Russian x Argentine) x Bison made at the Northern Great Plains Field Station, Mandan, North Dakota.

Minerva—Yellow-seeded; flowers are very dark blue. Yields have been moderately good. While it has been moderately susceptible to late wilt at St. Paul,

Table 12. Average Yields of Flax

Variety	Rosemount		Waseca		Morris		Crookston		Grand Rapids		Northern Minnesota		Southwestern Minnesota	
	Number of trials	Yield per acre	Number of trials	Yield per acre	Number of trials	Yield per acre	Number of trials	Yield per acre	Number of trials	Yield per acre	Number of trials	Yield per acre	Number of trials	Yield per acre
Bison	7	14.6	6	17.3	8	19.5	6	15.2	8	11.1	6	15.0	8	15.6
B5128	6	16.9	5	21.2	8	20.3	6	16.0	7	12.6	6	19.9	8	18.8
Redwood	7	18.1	6	22.0	8	22.0	6	15.9	8	13.4	6	20.4	8	18.2
Marine	7	15.5	6	19.5	8	20.9	6	13.5	8	13.0	6	18.7	8	16.8
Norland	3	16.2	2	19.9	5	20.5	3	14.1	4	11.8	3	19.5	5	17.9
Bolley	2	17.3	1	20.8	2	24.6	1	14.8	2	12.4	2	17.2	2	16.5
Raja	2	10.1	1	18.0	2	22.8	1	7.7	2	8.9	2	17.3	2	13.8
L.S.D. at 5% point		1.4		1.6		1.1		1.8		1.2		2.2		1.0

Table 13. Average of Flax Varieties for Date Ripe, Plant Height, Weight per 1,000 Seeds, Oil Content, and Iodine Number

Variety	Date ripe	Plant height	Weight of 1,000 seeds	Oil content	Iodine number
		(inches)	*(grams)*	*(percent)*	
Bison	August 16	22	5.9	40.0	181
B5128	August 22	22	6.5	39.9	185
Redwood	August 18	21	5.7	39.8	189
Marine	August 14	20	5.4	39.2	192
Norland	August 22	21	6.8	40.6	193
Bolley	August 18	22	6.0	40.4	193
Raja	August 13	21	6.6	38.2	182

it has been much more resistant at Fargo. Moderately resistant to rust; moderately susceptible to pasmo. Has exceeded all varieties in percentage of oil content; oil quality is similar to that of Redwing. Straw is slightly less valuable for fiber for paper production than other varieties. A selection made in Minnesota from a backcross of C.I. 649 x Bison.

Norland—Developed at the North Dakota Experiment Station as a selection from Victory, and similar in general appearance. Flowers are white; seeds are brown. Appears equal to Victory in yield. Like Victory it is moderately susceptible to wilt, very susceptible to pasmo. More uniform than Victory, but still contains some rust susceptible types.

Raja — Blue - flowered, brown - seeded, early-maturing. Seeds larger than Redwood or Bison. Moderately short straw when sown early; moderately tall when sown late. Resistant to rust, moderately susceptible to wilt; susceptible to pasmo. While it is slightly earlier than Marine, it has not been as dependable in producing a good yield. Oil content and quality are both low.

Redwing — Well-adapted for southern and central Minnesota. Not adapted for northwestern Minnesota, but has been satisfactory in Koochiching and Lake of the Woods Counties and parts of Roseau County. Early in maturity; moderately resistant to wilt; susceptible to pasmo and rust. The seed is small; produces an oil of high drying quality. Selected at Minnesota from Acc. No. 91. Where an early variety is required, Marine has been superior to Redwing.

Rocket—Developed in Canada. In Minnesota trials has yielded slightly less than Redwood. Resistant to rust; moderately susceptible to wilt and pasmo. Brown seeds, with good oil content of good quality; blue flowers.

Royal—Mid-late in maturity; moderately susceptible to rust and wilt; susceptible to pasmo. Oil content and quality similar to Bison. Weak straw. Developed at Saskatoon, Saskatchewan, Canada as C.A.N. 1727. Seeds are brown, flowers blue.

Sheyenne—Early variety, immune to races of rust found in Minnesota. Resistant to wilt; moderately susceptible to pasmo. In Minnesota trials has yielded less than recommended varieties, when both planted at an early date. Developed at the North Dakota Agricultural Experiment Station. Seeds are brown, flowers blue.

Victory—High-yielding; moderately susceptible to rust and wilt; very susceptible to pasmo. Lacks uniformity of type. Easily distinguished by the characteristic large white flowers and large brown seeds. Developed at the North Dakota Station.

Viking—Very similar to B. Golden.

SOYBEANS

Maturity before frost is an important consideration in soybean varieties used for seed production. Varieties must be earlier as the average growing season becomes shorter. For this reason the regions of adaptation for seed production are included in the description of varieties.

Varieties used for hay can be somewhat later maturing than those used for seed. In general, a variety can be used about one maturity zone (see the map; while these are corn maturity zones, the same general zones apply to soybean varieties) farther north for hay than for seed.

The "small plots" of table 14 are replicated three-row plots, which are 16 feet in length. At Waseca and Morris the rows are spaced 24 inches apart. At all other locations they are 40 inches apart. The "large plots" are four-rows wide and 100 to 150 feet in length. Planting and cultivating is done with ordinary corn-soybean equipment. Harvesting is done with a standard combine. These plots have been in use at Waseca since 1954 and at Morris since 1955.

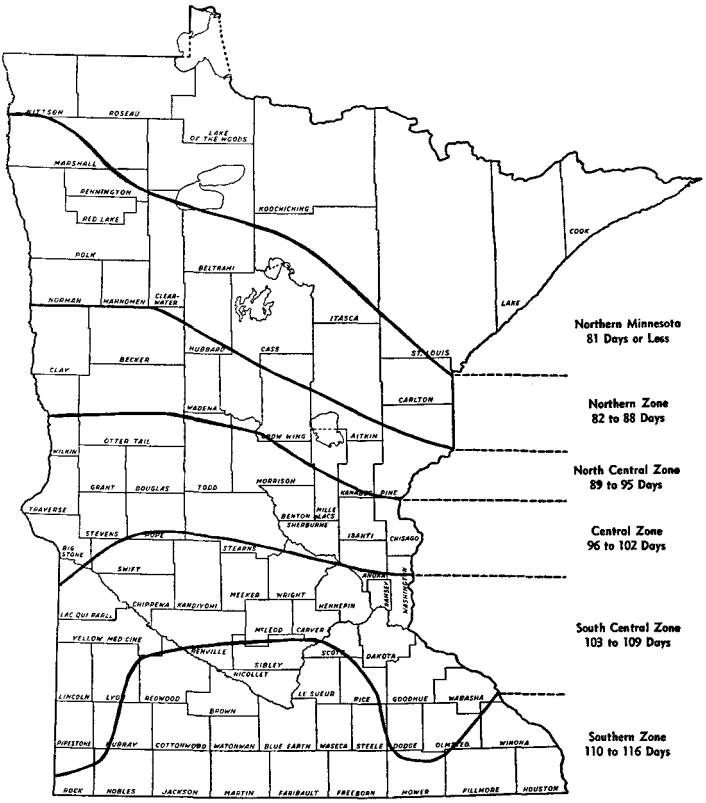
RECOMMENDED VARIETIES

Acme—A very early selection from the variety Pagoda, developed in Canada. In its maturity group has yielded well. Grows fairly short; stands well; medium oil content. Plant pubescence (hairiness on stems and pods) is gray; entire seed is yellow. Recommended for Northern Corn Maturity Zone and Northern Minnesota.

Blackhawk—Good yielding, medium tall, fairly resistant to lodging. Tends to bear lowest pods fairly well above the ground.

Table 14. Average Yields of Soybeans (Quantities Are in Bushels per Acre

	Small plots											Large plots	
	Southern locations					Central locations				Crookston			
	Years of trial	Blue Earth	South-western Minnesota	Waseca	Average, three locations	Years of trial	Morris	Rose-mount	Average of two locations	Years of trial	Yield	Waseca	Morris
												1954-56	1955-56
Acme	1956	.....	24.3	.....	.....	1956	28.5	27.1	27.8	1953-56	27.9	.....	.....
Blackhawk	1953-56	38.3	28.0	34.0	33.4	1953-56	35.0	35.2	35.1	.....	.....	31.7	29.2
Capital	1953-56	38.9	31.1	35.7	35.2	1953-56	37.6	39.9	38.8	.....	.....	31.8	32.3
Chippewa	1953-56	41.6	30.9	39.3	37.3	1953-56	35.5	38.9	37.2	.....	.....	35.0	28.6
Comet	1956	35.3	31.1	43.7	36.7	1956	37.3	38.7	38.0	1956	17.3	.....	.....
Flambeau	1956	32.8	.....	.....	.....	1953-56	34.7	31.7	33.2	1953-56	24.8	.....	23.9
Grant	1954-56	38.3	32.1	38.7	36.4	1953-56	38.1	40.1	39.1	.....	.....	.....	27.2
Habaro	1953-56	38.8	29.0	34.6	34.1	1953-56	31.5	34.2	32.9	.....	.....	.....	.....
Hardome	.....	.....	.....	.....	.....	1953-56	36.0	38.8	37.4	.....	.....	.....	.....
Harosoy	1953-56	38.5	31.9	33.9	34.8	1954-56	29.4	34.9	32.2	.....	.....	36.1	.....
Hawkeye	1953-56	34.0	27.3	30.2	30.5	.....	.....	.....	.....	.....	.....	.....	.....
Norchief	1955-56	37.6	32.5	40.3	36.8	1953-56	37.6	37.5	37.6	1953-56	24.7	.....	27.6
Ottawa Mandarin	1953-56	35.7	29.0	36.8	33.8	1953-56	38.2	37.5	37.9	.....	.....	31.5	27.0
Renville	1953-56	37.6	30.0	37.9	35.2	1953-56	36.6	35.3	36.0	.....	.....	29.4	26.9
L.S.D. at 5% point		2.2	2.0	2.6	1.3		2.4	2.5	1.7			2.2	2.9



MATURITY ZONES. For practical purposes, the same zones apply to soybeans that are used for corn hybrids. The zones indicate the approximate number of days growing season that may be expected from emergence after planting to maturity.

Medium-size seeds, yellow except for light-brown seed scars. Pubescence color is gray. Relatively high oil content. Selected at the Iowa Agricultural Experiment Station from a cross of Mukden x Richland. Recommended for Southern and South Central Corn Maturity Zones.

Capital — High-yielding, medium in height, with a distinct tendency to lodge. Small seeds, dull yellow with light-brown seed scars. Relatively high oil content. Plant pubescence is brown. Selected at the Central Experimental Farm, Ottawa, Canada, from a cross of 171 x A.K. (Harrow). Recommended for areas of the state south of Northern Corn Maturity Zone.

Chippewa—Superior in yielding ability, medium tall, very good resistance to lodging. Medium-size seeds, yellow with black seed scars. Relatively high oil content. Pubescence color is brown. Selected at U. S. Regional Soybean Laboratory, Urbana, Illinois, from the cross of Lincoln x (Lincoln x Richland). Averages six to eight days earlier than Blackhawk in maturity. Recommended for South Central and Southern Corn Maturity Zones, and about southern one-third of the Central Zone.

Flambeau—Rather short; with a considerable tendency to lodge. A good yielder among the early varieties. Yellow seeds with black seed scars; medium oil content. Pubescence is brown. Selected at the Wisconsin Agricultural Experiment Station from an introduction from Russia. Recommended for Central, and North Central, and Northern Corn Maturity Zones.

Grant — Medium-early, medium in height, has given very good yields. Good standing ability. Pubescence color is brown; seeds yellow with black seed scars. Oil content relatively high. Selected at Spooner, Wisconsin, from a cross of Lincoln x Seneca. Recommended for Central, South Central, Southern, and North Cen-

Table 15. Averages of Soybean Varieties for Date of Maturity, Plant Height, Lodging Score, Weight per 100 Seeds, and Oil Content in Southern and Central Locations and at Crookston *

Variety	Blue Earth, Southwestern Minnesota, and Waseca				Morris and Rosemount				Crookston				Oil content		
	Date mature	Plant height	Lodging score†	Weight per 100 seeds	Date mature	Plant height	Lodging score†	Weight per 100 seeds	Date mature	Plant height	Lodging score†	Weight per 100 seeds	Waseca	Morris	Crookston
		(inches)		*(grams)*		*(inches)*		*(grams)*		*(inches)*		*(grams)*		*(percent)*	
Acme	.....	.....	.....	.....	9-3	25	1.1	17.3	9-4	26	2.5	17.7	.....	.....	21.1
Blackhawk	9-21	38	2.3	16.2	9-28	40	3.2	16.4	.....	.....	.....	.....	21.3	21.8	.....
Capital	9-12	33	2.6	13.4	9-19	36	3.1	13.7	.....	.....	.....	.....	20.3	21.6	.....
Chippewa	9-15	36	1.6	15.4	9-21	35	2.1	15.4	.....	.....	.....	.....	21.4	21.8	.....
Comet	9-7	31	1.3	17.9	9-12	34	1.8	17.7	.....	36	2.2	14.3	.....	.....	.....
Flambeau	.....	.....	.....	.....	9-9	31	2.8	17.0	9-7	34	3.4	15.0	.....	19.7	20.4
Grant	9-11	32	1.9	16.2	9-17	33	2.1	17.2	.....	.....	.....	.....	21.1	21.8	.....
Habaro	9-20	32	2.5	19.2	9-26	35	2.9	18.7	.....	.....	.....	.....	18.7	19.8	.....
Hardome	.....	.....	.....	.....	9-16	38	2.9	17.0	.....	.....	.....	.....	20.4	21.4	20.4
Harosoy	9-24	42	2.9	17.8	10-1	43	3.7	17.2	.....	.....	.....	.....	20.3	20.0	.....
Hawkeye	9-29	42	2.4	17.0	.....	.....	.....	.....	.....	.....	.....	.....	20.7	.....	.....
Norchief	9-9	29	1.8	18.7	9-12	31	2.5	16.7	9-17	32	3.0	14.4	21.3	21.9	20.8
Ottawa Mandarin	9-9	30	1.4	19.6	9-16	31	1.8	20.7	.....	.....	.....	.....	20.5	20.5	20.3
Renville	9-15	32	1.4	18.4	9-22	33	2.0	18.1	.....	.....	.....	.....	22.2	22.4	.....

* *For the same years as shown in table—except oil contents for 1954-55 only.*

† *Lodging score of 1 erect; 5 completely lodged.*

tral Corn Maturity Zones. Best adapted as a full-season variety to the Central Zone.

Harosoy—Medium-late selection from a cross of Mandarin x (Mandarin x A.K.). Developed at the Dominion Experimental Farm, Harrow, Ontario. Good yields in southern Minnesota when compared to other varieties in 40- or 42-inch row spacings. Matures 4 to 6 days later than Blackhawk, so is recommended only in the Southern Corn Maturity Zone. Taller than Blackhawk, tends to lodge somewhat more. Oil content medium. Pubescence is gray. Medium-size seed; seed scar of same yellow as the seed coat.

Norchief—Has been outstanding in yield and oil content among the early varieties. Fairly short in growth with good resistance to lodging. Medium-size yellow seeds with black seed scars. Pubescence is brown. Selected at the Wisconsin Agricultural Experiment Station from a cross of Hawkeye x Flambeau. Mature a few days later than Flambeau, but several days earlier than Ottawa Mandarin; hence recommended for Central and North Central Corn Maturity Zones, and about southern one-half of the Northern Zone.

Ottawa Mandarin—Short and highly resistant to lodging. Fairly large yellow seeds with light-buff seed scars. Pubescence is gray. Oil content medium. Selected at the Central Experimental Farm, Ottawa, Canada, from the variety Mandarin. Recommended in areas of the state south of the Northern Corn Maturity Zone.

Renville — Short-to-medium in height; highly resistant to lodging. Medium-size yellow seeds with light-brown seed scars. Plants are gray. Highest oil content of any variety tested in Minnesota in recent years. Selected at the Minnesota Agricultural Experiment Station from a cross of Lincoln x (Lincoln x Richland) made at the U. S. Regional Soybean Laboratory at Urbana, Illinois. Averages about a week earlier in maturity than Blackhawk. Recommended for South Central and Southern Corn Maturity Zones, and southern one-third of the Central Zone.

VARIETIES NOT ADEQUATELY TESTED

Comet—Early variety developed at the Central Experimental Farm, Ottawa, Canada, from a cross of Pagoda x Mandarin. In cooperative regional trials—including tests at St. Paul, Morris, and Crookston—has averaged 1 or 2 days earlier than Ottawa Mandarin, several inches taller, about the same in yield and standing ability and slightly higher in oil content. Has been tested in regular Minnesota field plots only one year.

VARIETIES NOT RECOMMENDED

Bavender Special—Selected by an Iowa farmer; very late in maturity, lodges excessively, and is rather low in oil content.

Earlyana—Selected from a natural hybrid at the Purdue Agricultural Experiment Station. Has given only fair yields in Minnesota and lodged excessively. Matures 2 or 3 days later than Blackhawk.

Habaro—Tested and used in Minnesota longer than any other variety. Yields well; well-adapted to southern Minnesota. Low in oil content, tends to lodge, and often shatters in dry autumns. Selected at the Minnesota Agricultural Experiment Station from an early introduction.

Hardome—Early selection from a cross of Mandarin x (Mandarin x A.K.) made at the Dominion Experimental Farm, Harrow, Ontario. Matures the same or slightly earlier than Ottawa Mandarin; grows much taller and lodges considerably. Oil content medium; yielding ability fair-to-good in its maturity group.

Harman—A selection made in Ontario from the variety Manchu. Late and lodges rather badly. In Minnesota tests has yielded medium to low; oil content has been low.

Hawkeye—Developed cooperatively by the Iowa Agricultural Experiment Station and the U. S. Department of Agriculture from a cross of Mukden x Richland. Matures a week to 10 days later than Black hawk; has not outyielded it in Minnesota.

Korean—Selected in Canada, from an importation from the Orient. A Mr. Rickard of Champaign, Illinois, brought it to the United States. Gives relatively good yields in southern Minnesota, but oil content is only fair. Matures about 4 days later than Blackhawk, grows to medium height, and lodges rather badly. Very large seeds.

Lincoln—Selected at the U. S. Regional Soybean Laboratory from a cross of Mandarin x Manchu. Too late in maturity for Minnesota.

Manchu, Wis. 606—Selected at the Wisconsin Agricultural Experiment Station from the older Manchu variety, has been grown rather extensively in Minnesota. Similar to Habaro in yielding ability, maturity, and height; lodges somewhat more, but has an appreciably higher oil content.

Mandarin, Wis. 507—Selected at Wisconsin from the original Mandarin type. Once recommended for Minnesota, but yields less, lodges more, and has a lower oil content than Ottawa Mandarin. Not rec-

ommended after Ottawa Mandarin seed became available.

Monroe—Tall growing and about midway in maturity between Capital and Blackhawk. Has yielded lower than either in several years of testing, with a marked tendency to lodge. Selected at the Ohio Agricultural Experiment Station from a cross of Mukden x Mandarin.

Pridesoy 57—An early variety with good standing ability. Plants slightly shorter and oil content lower than Ottawa Mandarin. It is a selection from the older variety, Pridesoy.

SUNFLOWERS

Short, combine-harvested sunflowers are grown commercially in northwestern Minnesota. Most of the crop is sold to bird feed dealers and to a Canadian cooperative which processes sunflower seed as an oilseed crop like soybeans.

RECOMMENDED VARIETIES

Advance—Medium in yield and maturity and stands well for combining. Seed is small, low in hull, and high in oil content and bushel weight. Plant grows about 5 feet tall and matures about same time as early soybean varieties. Is a topcross hybrid released about 1945 by the Dominion Experimental Farms in Canada and is produced by crossing the inbred, S-37-388, with the variety, Sunrise. Only seed harvested from the S-37-388 in the crossing field should be used for seed. Farmers should buy new, certified seed every year just as they do with hybrid corn.

Arrowhead — High yielding. About 6 days earlier than Advance, slightly taller, not quite as strong-stalked. Seed is medium in size, low in hull, medium in oil content, high in bushel weight. Shows more seedling vigor and less bird damage than Advance. An open-pollinated variety; seed for next year's planting can be saved from the commercial crop. Selected from Mammoth Russian by M. J. Thompson at the Northeast Experiment Station about 1920. Recommended as a feed variety only.

VARIETIES NOT RECOMMENDED

Beacon—Medium in yield, late-maturing and taller than Arrowhead. Seed is small, high in hull, medium in oil content, and high in bushel weight. Variety lacks uniformity in height, maturity, and seed color. Most rust-resistant variety tested; developed at the Dominion Experimental Farm, Morden, Manitoba, by combining 27 rust-resistant lines.

Commercial Advance or "Advance, second generation" yields considerably less than Advance and should not be used for planting.

Greystripe and **Manchurian** varieties are very tall and too late-maturing for commercial production in Minnesota.

Mennonite—High yielding. Slightly later maturing and taller than Arrowhead. Seed is large, high in hull, low in oil content, medium in bushel weight. Originated in Russia many years ago.

ALFALFA

RECOMMENDED VARIETIES

FOR ALL ROTATIONS

Ladak—Winter-hardy, wilt-resistant variety. Introduced by the U. S. Department of Agriculture from northern India. Slightly higher average than Ranger in forage yield. Recovers slowly after cutting, but yield of second cutting has not been much lower than other varieties. Recommended for seeding in both long and short rotations. Susceptible to leafspot diseases.

Ranger — Winter - hardy, wilt - resistant variety. Developed by the U. S. Department of Agriculture and the Nebraska Agricultural Experiment Station. Slightly superior to Ladak in wilt resistance. Recommended for seeding in both long and short rotations. Susceptible to leafspot diseases.

Vernal—Developed at the Wisconsin Agricultural Experiment Station; released in 1953. More wilt-resistant than Ranger; yields more forage. In Wisconsin trials, has shown excellent winter-hardiness. Susceptible to leafspot diseases.

Table 16. Average Adjusted Yields of Sunflower Seed

Variety	Crookston		Southwestern Minnesota		Rosemount		Anoka		Average
	Years of trial	Yield per acre	Years of trial	Yield per acre	Years of trial	Yield per acre	Years of trial	Yield per acre	Yield per acre
		(pounds)		*(pounds)*		*(pounds)*			*(pounds)*
Advance	1948-56	1,071	1951-56	1,082	1953-56	932	1953, 55	655	935
Arrowhead	1948-56	1,435	1951-56	1,080	1953-56	1,283	1953, 55	1,028	1,207
Beacon	1954-56	540	1954-56	1,019	1954-56	1,113	1955	715	847
Mennonite	1953-56	1,309	1953-56	1,059	1954-56	1,159	1953-55	868	1,099
L.S.D. at 5% point		126		338		242		253	126

Table 17. Adjusted Averages of Sunflower Varieties at Four Locations for Date Mature, Plant Height, Head Diameter, Shattering Loss, Kernel Weight, Oil Content, Hull Percentage, and Bushel Weight

Variety	Date mature	Plant height	Head diameter	Shattering loss	Weight of 100 kernels	Oil*	Hull	Bushel weight
		(inches)	*(percent)*	*(percent)*	*(grams)*	*(percent)*	*(percent)*	*(pounds)*
Advance	September 15	57	6.2	14	6.4	31.8	41.2	28.1
Arrowhead	September 9	61	5.2	6	7.7	30.6	42.1	28.1
Beacon	September 20	67	5.9	17	5.3	29.9	45.5	31.6
Mennonite	September 13	64	5.5	2	8.3	27.0	47.0	25.3

* *Dry matter basis.*

FOR SHORT ROTATIONS ONLY
(Two Crop Years or Less)

Narragansett—Developed by the Rhode Island Agricultural Experiment Station. In Minnesota trials, has produced forage yields definitely higher than Ranger, slightly higher than Ladak. Winter-hardy; recovers rapidly after cutting; seedlings are vigorous. Susceptible to leafspot diseases and bacterial wilt. Should be seeded only in short rotations (one or two years of hay production). Appears to be low in seed production; may never become a widely grown variety.

VARIETIES NOT ADEQUATELY TESTED

DuPuits — A variety introduced from France. Very susceptible to bacterial wilt and may not be sufficiently winter-hardy for Minnesota. Forage yields satisfactory in limited trials. Susceptible to leafspot diseases.

Lahontan — Developed cooperatively by the U. S. Department of Agriculture and the Nevada Agricultural Experiment Station. Resistant to bacterial wilt, stem nematode, and the spotted alfalfa aphid. (Neither of the last two pests are important at present in Minnesota.) May not be sufficiently winter-hardy for Minnesota. It was first sown here in 1956.

Rambler—Developed at the Swift Current Experiment Station in Canada. A creeping alfalfa (spreads under ground by roots) first sown in Minnesota in 1956.

Socheville—A variety introduced from France. Very susceptible to bacterial wilt. Winterhardiness not satisfactorily established. Forage yields satisfactory in limited trials. Susceptible to the leafspot diseases.

VARIETIES NOT RECOMMENDED

Uncertified southwestern-grown seed should never be seeded for forage production; plants grown from such seed lack winter-hardiness. However, certified seed of adapted varieties produced in southwestern United States is perfectly satisfactory in Minnesota.

Common alfalfas are named for state or region in which they are grown. The seed is not designated as a variety, and performance is not consistent from one lot to another. Generally, the common alfalfas are susceptible to bacterial wilt and yield somewhat less than improved varieties.

Alfalfa blends sold under trade brands are being offered in Minnesota. These should not be considered as varieties, because varietal identification is lost when seed from different lots is blended. Blending does not increase winter-hardiness, disease-resistance, or insect-resistance over that expected in the original lots.

Atlantic—A synthetic variety developed by the New Jersey Agricultural Experiment Station. Yields about the same as Ranger; but susceptible to bacterial wilt and not sufficiently winter-hardy for Minnesota. Susceptible to leafspot diseases.

Table 18. Forage Yields, Stand Readings, and Winter Killing for Ten Varieties of Alfalfa Grown on Wilt-Infested Soil at Rosemount, Minnesota

Variety	1954	1955	1956	Three-year average	Stand*		Winter killing† 1955-56
					1954	1956	
	(tons per acre)	*(tons per acre)*	*(tons per acre)*	*(tons per acre)*	*(percent)*	*(percent)*	*(percent)*
Ladak	4.06	5.01	4.00	4.36	70	44	24.8
Narragansett	4.26	5.19	3.65	4.37	85	47	37.3
Ranger	3.97	5.13	4.02	4.37	79	68	24.4
Vernal	4.45	5.47	4.66	4.86	73	69	16.5
Atlantic	4.09	5.30	3.37	4.25	83	43	29.7
Buffalo	3.98	5.14	3.44	4.19	80	57	42.0
DuPuits	4.09	5.18	0.51	3.26	80	6	64.2
Grimm	3.73	4.78	3.00	3.84	82	41	20.0
Rhizoma	4.08	4.72	3.00	3.93	84	42	23.3
Socheville	4.17	5.30	0.78	3.42	81	11	63.0
L.S.D. at 5% point	0.38	0.37	0.92	0.34			

* *Based on visual estimates of stand.*

† *Based on actual plant counts. Winter-killing occurred during 1955-56 winter.*

Table 19. Average Forage Yields for Eleven Alfalfa Varieties Grown on Soil Not Infested with Bacterial Wilt

Variety	Crookston 1951-53	Crookston 1954-56	Grand Rapids 1951-52	Grand Rapids 1954-56	Morris 1950-53	Morris 1954-56	Rosemount 1950-53	Waseca 1951-52	Waseca 1954-55
					(tons per acre)				
Ladak	1.41	2.91	3.44	2.86	2.85	2.47	4.07	2.71	3.56
Narragansett	1.36	2.94	3.54	3.14	2.95	2.63	4.14	3.05	3.84
Ranger	1.29	2.91	2.90	2.88	2.85	2.64	3.70	2.72	3.37
Vernal	.....	3.01	.....	3.11	.....	3.17	.....	.....	4.07
Atlantic	1.25	3.03	3.11	2.76	2.84	2.61	3.96	2.75	3.77
Buffalo	1.14	2.38	2.63	2.72	2.84	2.45	3.73	2.32	3.03
DuPuits	.....	3.22	.....	2.88	.....	2.61	.....	.....	3.84
Grimm	1.14	2.82	3.08	2.87	2.64	2.56	3.64	2.69	3.75
Italian No. 121	.....	.....	.....	2.86	.....	2.54	.....	.....	.....
Rhizoma	1.22	2.85	3.56	3.08	.....	2.50	.....	2.75	3.44
Socheville	.....	3.04	.....	.....	.....	.....	.....	.....	3.43
L.S.D. at 5% point	0.10	0.25	0.17	0.22	0.14	0.31	0.21	.....	0.49

Buffalo—A wilt-resistant variety developed by selection from Kansas Common, which it resembles in most other characteristics. Not sufficiently winter-hardy for Minnesota. Resistant to leafspot diseases.

Grimm—A winter-hardy variety developed in Carver County by Wendelin Grimm. Where bacterial wilt is prevalent, persistence of Grimm is decidely less than Ranger and lower than Narragansett or Vernal, where wilt is not a factor. Susceptible to leafspot diseases.

Nomad — Developed in Oregon from plants of an old stand that spread by underground stems. Under conditions where adapted, Nomad is a spreading or creeping variety. Not adapted to Minnesota.

Rhizoma—Developed by the University of British Columbia. Under favorable conditions, spreads by underground stems—but has not shown this characteristic in Minnesota. In trials, yields about equal to Ranger but is very susceptible to bacterial wilt. Susceptible to leafspot diseases.

Talent—Selected from the French variety, Provence. Susceptible to bacterial wilt, the leafspot diseases, and is not sufficiently winter-hardy for Minnesota.

Williamsburg — Selected from Kansas Common for stem rot resistance. Like Kansas Common, is not sufficiently winter-hardy for Minnesota. Susceptible to leafspot diseases.

BROMEGRASS

RECOMMENDED VARIETIES

Lincoln, Achenbach, and Fischer — All recommended. These southern strains start growth earlier in the spring than Canadian brome and are somewhat more productive. Lincoln was selected in Nebraska, Achenbach in Kansas, and Fischer in Iowa. All are so-called farm strains. That is, they have been grown by one or two farmers, in the areas designated, for a long period of time and seem to have acquired a natural adaptation.

VARIETIES NOT RECOMMENDED

Elsberry — A southern, early maturing type of bromegrass, the best of several accessions tested in the Soil Conservation Service Nursery at Elsberry, Missouri. Believed to be derived from an old field of bromegrass located in northwestern Missouri or southeastern Iowa.

Homesteader—Composite of five strains originating from fields established in South Dakota 40 or 50 years ago. Has been increased at the South Dakota Agricultural Experiment Station.

Lancaster (Nebr. 44)—A new strain developed at the Nebraska Agricultural Experiment Station. A synthetic variety, produced by hybridization of several unre-

Table 20. Average Forage and Seed Yields of Bromegrass Varieties from Rosemount, Waseca, Morris, Crookston, and Grand Rapids—1951-1956 *

Variety	Forage yield (15 percent moisture)		Seed yield
	First cutting	Second cutting	
	(tons per acre)		(pounds per acre)
SOUTHERN TYPE			
Lincoln	1.82	1.26	168
Achenbach	1.80	1.28	131
Fischer	1.79	1.21	164
Elsberry	1.66	1.12	104
Lyon	1.78	1.27	124
Lancaster	1.79	1.26	179
NORTHERN TYPE			
Canadian Commercial	1.36	0.97	153
Martin	1.71	1.25	..
Manchar	1.66	1.34	215
Mandan 404	1.50	1.36	.....
Homesteader	1.66	1.16	142

** Three replications were made at each station during the period. Not all stations were represented every year, but each of them were for at least 2 of the 6 years. Twenty-one first cuttings, 9 second cuttings, and 7 seed harvests are included.*

lated outstanding plants. Has shown superior forage yield, quality, and seed yield in tests at the Nebraska Agricultural Experiment Station.

Lyon (Nebr. 36) — Similar to Lincoln, shows considerable refinement of plant characters over it. Outstanding in its production of high-quality, relatively heavy seed. Preliminary testing shows it to be equal or superior to Lincoln in forage and seed yields. Increased at the Nebraska Agricultural Experiment Station.

Manchar—Tall, leafy, semibunch type of bromegrass introduced from Manchuria, under P.E.I. 109812, by the U. S. Department of Agriculture and subjected to mass selection at Pullman, Washington. Outstanding characteristics are seedling vigor and high seed production. Intermediate in growth habit between the southern type, as exemplified by Achenbach, and the northern type of smooth bromegrass. Increased at the Washington Agricultural Experiment Station, Pullman.

Martin — A mass selection developed from plants obtained from seed produced on an old bromegrass field in Martin County, Minnesota. Increased at the Minnesota Agricultural Experiment Station.

RED CLOVER

Tests conducted from 1923-27 by Professor A. C. Arny showed that locally grown strains of medium red clover were markedly superior to introductions from foreign countries and the southern United States. Average yields of forage collected from experiments conducted from 1945 through 1955 show Dollard and Midland to be equal in yield to good commercial seed purchased in Minnesota. With this situation existing, it is considered advisable to use named, adapted varieties so that the seed is of known origin and performance.

RECOMMENDED VARIETIES

Midland—A blend of strains from Ohio, Indiana, Illinois, and Iowa produced through the cooperation of several midwest experiment stations and the U. S. Department of Agriculture. Under Minnesota conditions, equal to Wegener in forage yield for both first and second cuttings. A good seed producer.

Wegener—A strain grown for a number of years by E. C. Wegener, Bertha, Minnesota. Adapted to Minnesota conditions; good forage and seed yielder, and provides a good second cutting.

Dollard—Selected several years ago at MacDonald College, Quebec, Canada. Superior in seed yield. It has been shown to be resistant to some forms of anthracnose in regional tests. Limited Minnesota data indicate resistance to black stem, virus, and root rot. The seed is being increased by the National Foundation Seed Stocks Project.

VARIETIES NOT RECOMMENDED

Altaswede—Late, single-cut type developed by the Alberta, Canada, Agricultural Experiment Station. Despite claims made for it, has not proved to be perennial in tests in Minnesota, and has yielded significantly less than commercial Mammoth. Smooth (not hairy) leaves, reputed to make it susceptible to leafhopper attacks.

Kenland—Only variety of which large amounts of seed are commercially available. Resistant to southern anthracnose; adapted to approximately the southern half of the red clover belt. Susceptible to northern anthracnose, and probably not sufficiently winter-hardy for Minnesota. Developed by the Kentucky Agricultural Experiment Station and the U. S. Department of Agriculture.

Table 21. Average Forage and Seed Yields of Red Clover Varieties at All Minnesota Experiment Stations—1945-1955 *

Variety	Forage yield (15 percent moisture)		Seed yield
	First cutting	Second cutting	
	(tons per acre)		*(pounds per acre)*
Wegener	1.84	1.31	125
Midland	1.83	1.44	110
Dollard	1.84	1.33	139
Minnesota Commercial	1.90	1.39	113

** The number of years at each station varied. There were 55 tests in all, each with 3 or 4 replications. In 26 tests second cuts were taken. Seed yield represents 7 harvests in 1954 and 1955.*

BIENNIAL SWEETCLOVER

RECOMMENDED VARIETIES

Evergreen — White-blossomed, introduced from Ohio. Produces a larger growth than common types the fall of first year, is a heavy forage producer the second year, and comes to full bloom two weeks later than common types. Therefore, has a longer grazing season.

Madrid — Yellow-blossomed, biennial type introduced from Madrid, Spain, in 1910. First-year growth is superior to common types; forage and seed production the second year are satisfactory.

VARIETIES NOT RECOMMENDED

Alpha—Dwarf variety developed at the University of Saskatchewan.

Brandon Dwarf — Dwarf white variety developed at Brandon, Manitoba.

Erector—White-blossomed variety mass-selected at Brandon, Manitoba. Lower branches ascend at an acute angle.

Nebraska Fine Stem—A selection made at the Nebraska Experiment Station.

No. 1 Arctic—Derived from a Siberian importation. White blossoms.

Spanish, Reg. No. 1—White-blossomed; introduced from Madrid, Spain, in 1910 and formerly called Madrid white.

Table 22. Maturity Rating and Forage Yield of Biennial Sweet Clover Varieties

Variety	Maturity rating	Yield score* fall seedling year	Yield forage, second year in percent of Commercial yellow
			(percent)
Evergreen	Very late	1.7	115
Madrid	Early	2.8	102
Commercial white	Medium	3.2	102
Commercial yellow	Early	3.5	100

** Scores 1 to 5; 1 is best.*

BIRDSFOOT TREFOIL

Among trefoil varieties adequately tested to date, only **Empire** and **Viking** (both New York selections) appear winter-hardy enough for Minnesota conditions. Empire is recommended because it is slightly superior to Viking in winter-hardiness and because Viking has been tested less extensively. Empire grows along the ground; Viking is upright.

Cascade, Granger, new introductions of European broadleaf, and all the narrowleaf types tested are clearly inferior in winter-hardiness. This is especially true of the narrow leaf types.

From one year's result at Rosemount, **Mansfield** is satisfactory in yield but no test of winter hardiness has been obtained. Mansfield is erect-growing and somewhat earlier blooming than Empire and Viking.

Table 23. Yields and Stands of Birdsfoot Trefoil at the Rosemount Station, 1953 and 1954

Variety	Total yield, 1953*	Stand 6-16-53	Total yield, 1954*	Stand 5-5-54
	(tons per acre)	*(percent)*	*(tons per acre)*	*(percent)*
Empire	2.71	93	.83	88
Viking	2.92	93	.87	83
Cascade†	2.98	95	.50	47
Granger†	2.96	95	.40	42
Italian Broadleaf	2.69	87	.80	42
Oregon narrowleaf	1.22	85	zero	3

** Yields tested at 15 percent moisture.* *† Cascade and Granger are Oregon selections.*

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. Field peas are also used as a forage crop and, for this purpose, are usually sown in a mixture with oats.

RECOMMENDED VARIETIES

Chancellor — Medium in maturity and long vined. Small, cream-colored seed, high in bushel weight. Selected at the Dominion Experimental Farm, Ottawa, Canada in 1906 from an English variety also called Chancellor.

Dashaway—Very similar to Chancellor. Selected in 1914 from Golden Vine by F. J. Dash, a Saskatchewan farmer, and distributed by the University of Saskatchewan in 1922. Generally grown on more acres in Minnesota than any other variety of dry, edible peas.

VARIETIES NOT ADEQUATELY TESTED

O.A.C. 181 — Early-maturing and long-vined. Cream-colored seed, medium in size and bushel weight. Originated in 1918 at the Ontario Agricultural College from a cross of Prussian Blue x White Wonder.

VARIETIES NOT RECOMMENDED

Alaska — Low-yielding, very early-maturing, short-vined. Green-colored seed, medium in size and bushel weight. Also used as a canning variety. Introduced as an American variety about 1884, but probably was the same as the English variety, Earliest of All. Many strains are available.

First and Best—Short-vined and earliest maturing of the cream-colored varieties. Seed is medium in size and bushel weight; seems to be desirable for splitting. Of American origin, has sometimes been called Extra Early. Grown on more acres in the United States than any other cream-colored pea.

Multiplier — Late-maturing and long-vined. Small, cream-colored seed, high in bushel weight. Thought to be of Canadian origin.

Table 24. Adjusted Averages of Pea Varieties at Crookston for Seed Yield, Date of First Bloom, Date Mature, Seed Weight, and Bushel Weight

Variety	Years of trial	Yield per acre	Date first bloom	Date mature	Weight of 100 seeds	Bushel weight
		(bushels)			*(grams)*	*(pounds)*
Chancellor	1948-56	24.2	June 30	August 17	12.6	63.4
Dashaway	1948-56	24.7	June 30	August 17	12.4	63.4
Multiplier	1948-56	23.0	July 4	August 21	13.4	63.5
Valley	1952-56	23.6	July 1	August 15	19.7	62.7
O.A.C. 181	1953-56	25.3	June 23	August 16	16.5	62.4
First and Best	1948-52, 1955-56	23.9	June 21	August 8	15.7	62.4
L.S.D. at 5% point		2.3				

Valley—Early-maturing and long-vined. Large, cream-colored seed, medium in bushel weight. Originated in 1924 at the Dominion Experimental Farm, Ottawa, Canada, from a cross of Chancellor x Early Raymond.

CORN TRIALS

Information on corn is no longer included in this report. Comparative trials of experiment station and commercial corn varieties are now published annually in two bulletins of the Minnesota Agricultural Experiment Station:

Miscellaneous Report 20—MATURITY RATINGS FOR CORN HYBRIDS IN MINNESOTA, 1957-58.

Miscellaneous Report 28—MINNESOTA HYBRID CORN PERFORMANCE TRIALS, 1956.

CERTIFIED SEED DIRECTORY

Registered and certified seed of most of the good varieties described in this bulletin can be purchased from growers listed in in the Minnesota Registered and Certified Seed Directory. This annual publication can be obtained without charge from the Minnesota Crop Improvement Association, St. Paul Campus, University of Minnesota, St. Paul 1, Minnesota.