

1978 EDITION

Revised December 1977

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VARIETAL TRIALS OF FARM CROPS

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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 Becker, and on farmers' fields.

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

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

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

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

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

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

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

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

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

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

The use of certified seed of recommended varieties is suggested. Varieties eligible for certification by the Minnesota Crop Improvement Association include varieties recommended by the Minnesota Agricultural Experiment Station, certain new varieties

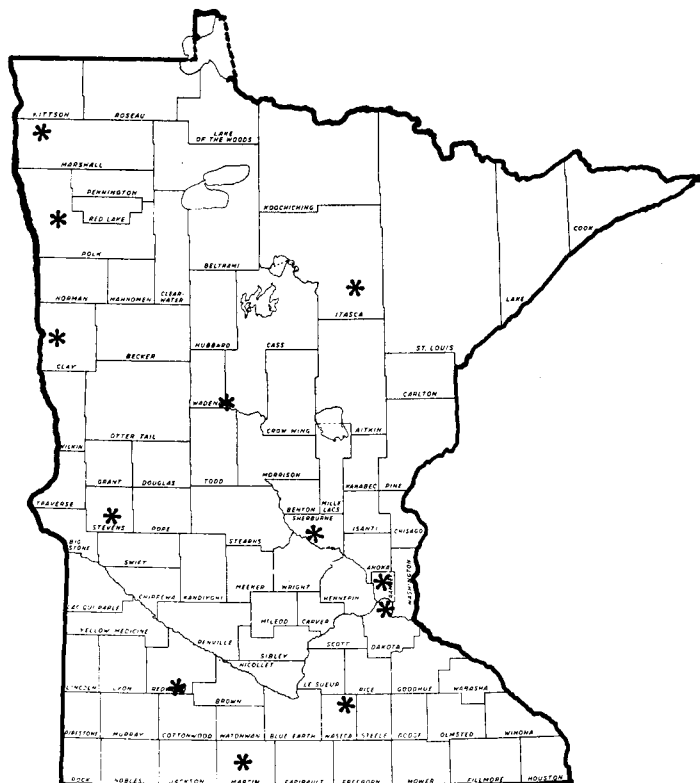
not adequately tested in Minnesota, and certain nonrecommended varieties. Certification does not imply recommendation.

Registered and certified seed of most varieties described in this report can be purchased from seed dealers or from growers listed in the Minnesota Registered and Certified Seed Directory for 1978 Planting. This annual publication can be obtained without charge from the Minnesota Crop Improvement Association, 1900 Hendon Avenue, St. Paul, Minnesota 55108, or from county extension agents' offices.

Authors of the following sections are: barley, D.C. Rasmusson; oats, D.D. Stuthman; durum and hard red spring wheat, F.A. Elsayed; winter wheat, R.L. Thompson and F.A. Elsayed; rye, millet, annual canarygrass, grain sorghum, buckwheat, field pea, field bean, and sunflower, R.G. Robinson; corn, J.L. Geadelmann and R.H. Peterson; flax, V.E. Comstock; soybean, J.W. Lambert; alfalfa, birdsfoot trefoil, and red clover, D.K. Barnes and F.I. Frosheiser; and bromegrass, orchardgrass, reed canarygrass, tall fescue, and timothy, A.W. Hovin. Extension agronomists D.R. Hicks and R.L. Thompson also participated in preparing this publication.

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

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



* 1977 varietal trials were conducted at these locations.

ALFALFA

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

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

The varieties listed in tables 1 and 2 are ranked according to winterhardiness index, which is an indication of rate of growth and degree of winterhardiness. *Very winterhardy varieties* are slow to recover after cutting. These varieties will survive nearly all winters. Except for the variety Ramsey they usually are not high yielding because they recover slowly for the second crop and produce only a small third crop because of early dormancy. *Winterhardy varieties* are adapted to all areas of the state. Forage yields vary among varieties in this group, primarily because of disease and insect resistance. Three or four years of production can be expected from most winterhardy varieties, but a few can be productive for five or more years. *Moderately winterhardy varieties* usually reach 1/10 bloom several days earlier than more winterhardy varieties. They are also characterized by rapid recovery after harvest.

Nonwinterhardy varieties should not be grown in Minnesota except for plowdown in the seedling year. Varieties in this group are not listed in the tables but include African, Amador, Ardiente, AS-13R, AS-49R, Bonanza, Caliente, Caliverde, Caliverde 65, CUF 101, Delta, El-Unico, Florida 66, Hairy Peruvian, Hayden, Joaquin II, Mesa Sirsa, Mesilla, Moapa, Moapa 69, Salton, Sonora, Sonora 70, 183, WL 504, WL 508, WL 600, UC Cargo, Unico, 183, and 572.

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

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



Agronomist D.M. Smith and student W.T. Dougherty cut alleyways before harvesting research plots of alfalfa in mid-July. The plots were sown April 26 on irrigated sandy soil without a companion crop. EPTC herbicide controlled grass weeds but not ragweed.

Table 1. Average yields expressed as percentage of Vernal for all tests in Minnesota, 1959-1977

| Variety | Yield (percent of Vernal) | | | | | | |
|-------------------------------|---------------------------|-----|-----|-----|---------|--------------------|-----|
| | Year after seeding | | | | | Average over years | |
| | 1st | 2nd | 3rd | 4th | 5th-9th | 1-2 | 3-9 |
| VERY WINTERHARDY | | | | | | | |
| Norseman | 96 | 93 | 89 | — | — | 95 | 89 |
| Ladak | 87 | 88 | 78 | 89 | — | 88 | 82 |
| Teton | 89 | 93 | 86 | 93 | — | 91 | 89 |
| Travois | 88 | 88 | 88 | 87 | — | 88 | 88 |
| Ramsey | 100 | 102 | 103 | 114 | 111 | 101 | 109 |
| WINTERHARDY | | | | | | | |
| Baker | 101 | 109 | 113 | 106 | 126 | 104 | 113 |
| Vernal, tons 15% | | | | | | | |
| DM hay/acre | 4.8 | 4.6 | 4.3 | 4.3 | 4.3 | 4.7 | 4.3 |
| Titan | 101 | 101 | 104 | 103 | 104 | 101 | 104 |
| Conquest | 97 | 105 | 107 | 107 | 112 | 101 | 109 |
| 123 | 101 | 104 | 101 | 102 | 110 | 102 | 102 |
| WL 215 | 100 | 106 | 109 | 101 | 115 | 102 | 108 |
| Agate | 99 | 102 | 105 | 100 | 104 | 100 | 104 |
| Iroquois | 109 | 104 | 105 | 110 | 105 | 107 | 106 |
| Ladak 65 | 99 | 104 | 101 | 99 | 102 | 102 | 100 |
| Nugget | 103 | 103 | 97 | 97 | 96 | 103 | 97 |
| 520 | 105 | 110 | 109 | 111 | 114 | 107 | 111 |
| 521 | 98 | 105 | 100 | 96 | 96 | 100 | 97 |
| SX-10 | 94 | 96 | 99 | 103 | 107 | 95 | 102 |
| 153 | 97 | 103 | 85 | 92 | 47 | 100 | 77 |
| Valor | 102 | 104 | 100 | 105 | 120 | 103 | 105 |
| Weevlchek | 107 | 107 | 109 | 103 | 98 | 107 | 105 |
| Anchor | 104 | 108 | 117 | 109 | 117 | 106 | 113 |
| Polar 1 | 106 | 102 | 100 | 99 | 118 | 105 | 106 |
| Ranger | 97 | 98 | 97 | 99 | 93 | 97 | 97 |
| MODERATELY WINTERHARDY | | | | | | | |
| Pacer | 105 | 105 | 112 | 111 | — | 105 | 111 |
| Citation | 106 | 106 | 110 | 106 | — | 106 | 109 |
| Marathon | 114 | 109 | 106 | 98 | 93 | 112 | 99 |
| WL 307 | 104 | 104 | 104 | 102 | 105 | 104 | 104 |
| Apollo | 102 | 98 | 82 | — | — | 100 | 82 |
| Tempo | 100 | 106 | 92 | 103 | 86 | 103 | 93 |
| A59 | 101 | 104 | 108 | 110 | 101 | 102 | 104 |
| WL 310 | 99 | 99 | — | — | — | 99 | — |
| 530 | 101 | 102 | 90 | 96 | 90 | 102 | 91 |
| WL 309 | 106 | 105 | 102 | 104 | 110 | 106 | 104 |
| WL 311 | 102 | 104 | 104 | — | — | 103 | 104 |
| Honeoye | 102 | 105 | 108 | — | — | 103 | 108 |
| Saranac AR | 106 | 104 | 112 | — | — | 105 | 112 |
| WL 318 | 99 | 96 | — | — | — | 97 | — |
| G 777 | 101 | 100 | 97 | 104 | — | 100 | 100 |
| Saranac | 101 | 101 | 103 | 105 | 101 | 101 | 103 |
| Thor | 103 | 104 | 100 | 104 | 104 | 104 | 101 |
| Vista | 103 | 102 | 98 | 102 | — | 103 | 100 |
| A57 | 103 | 101 | 94 | 109 | 108 | 102 | 101 |
| Glacier | 101 | 104 | 95 | 74 | 25 | 103 | 67 |
| Atlas | 94 | — | — | — | — | 94 | — |
| Warrior | 97 | 103 | 99 | 101 | 82 | 100 | 95 |
| 131 | 103 | 104 | 104 | 98 | 99 | 103 | 101 |
| Olympic | 97 | 92 | — | — | — | 95 | — |
| WL 219 | 105 | — | — | — | — | 105 | — |
| Vanguard | 108 | 95 | — | — | — | 102 | — |
| Stride | 94 | 102 | 99 | 85 | 25 | 97 | 74 |

Table 2. Winterhardiness index and disease resistance of alfalfa varieties eligible for certification

| Variety | Developer or owner ¹ | Winter hardiness (index) ² | RESISTANT PLANTS ³ | |
|------------------------|--|---------------------------------------|-------------------------------|---------------------------------|
| | | | Bacterial wilt (percent) | Phytophthora root rot (percent) |
| VERY WINTERHARDY | | | | |
| Norseman | Barzen of Minneapolis | 7.9 | 30 | 4 |
| Ladak | USDA (foreign introduction) ^e | 7.5 | 8 | 2 |
| Teton | S. Dakota Agr. Exp. Sta. | 7.4 | 15 | 7 |
| Travois | S. Dakota Agr. Exp. Sta. ^p | 7.4 | 37 | 1 |
| Ramsey | Minnesota Agr. Exp. Sta. & USDA | 6.7 | 37 | 9 |
| WINTERHARDY | | | | |
| Baker | Nebraska Agr. Exp. Sta. & USDA ^p | 6.5 | 50 | 3 |
| Vernal | Wisconsin Agr. Exp. Sta. & USDA ^{eghikpq} | 6.5 | 42 | 2 |
| Titan | Rudy Patrick Co. ^e | 6.4 | 60 | 2 |
| Conquest | Pioneer Hi-Bred International Inc. ^l | 6.3 | 21 | 4 |
| 123 | DeKalb Ag Research Inc. ^b | 6.3 | 41 | 3 |
| WL 215 | Waterman-Loomis Co. ^h | 6.3 | 36 | 4 |
| Agate | Minnesota Agr. Exp. Sta. & USDA ^{ehkqpq} | 6.0 | 65 | 43 |
| Iroquois | Cornell University ^q | 6.0 | 61 | 1 |
| Ladak 65 | Montana Agr. Exp. Sta. | 6.0 | 36 | 2 |
| Nugget | P-A-G ^j | 5.9 | 46 | <1 |
| 520 | Pioneer Hi-Bred International Inc. ^m | 5.9 | 40 | 1 |
| 521 | Pioneer Hi-Bred International Inc. ^m | 5.9 | 19 | 1 |
| SX-10 | Sexauer Co. ^p | 5.7 | 5 | 3 |
| 153 | DeKalb Ag. Research Inc. | 5.7 | 2 | 8 |
| Valor | Land O'Lakes ^g | 5.5 | 36 | 2 |
| Weevichek | Farmers Forage Res. Coop. | 5.5 | 57 | 2 |
| Anchor | Rudy Patrick Co. ^e | 5.4 | 36 | 3 |
| Polar 1 | Pride Seed Co. ⁿ | 5.4 | 49 | 8 |
| Ranger | Nebraska Agr. Exp. Sta. & USDA ^{eghk} | 5.4 | 18 | 2 |
| MODERATELY WINTERHARDY | | | | |
| Pacer | Land O'Lakes ^g | 5.3 | 33 | 8 |
| Citation | North American Plant Breeders ^h | 5.2 | 45 | 2 |
| Marathon | Cargill ^a | 5.2 | 36 | 2 |
| WL 307 | Waterman-Loomis Co. | 5.2 | 26 | <1 |
| Apollo | North American Plant Breeders ^e | 5.1 | 36 | 40 |
| Tempo | Farmers Forage Res. Coop. | 5.1 | 26 | 2 |
| A59 | E.F. Mangelsdorf & Bros. Inc. ^o | 5.0 | 16 | 4 |
| WL 310 | Waterman-Loomis Co. | 5.0 | 42 | 3 |
| 530 | Pioneer Hi-Bred International Inc. ^m | 5.0 | 38 | 2 |
| WL 309 | Waterman-Loomis Co. ^{hk} | 4.7 | 25 | 3 |
| WL 311 | Waterman-Loomis Co. | 4.7 | 36 | 2 |
| Honeoye | Cornell University | 4.6 | 16 | <1 |
| Saranac AR | Cornell University | 4.6 | 29 | 8 |
| WL 318 | Waterman-Loomis Co. ^{hk} | 4.6 | 32 | 20 |
| G777 | Funk Seed Int. ^d | 4.5 | 25 | 4 |
| Saranac | Cornell University ^{gq} | 4.5 | 49 | 2 |
| Thor | Northrup, King & Co. ⁱ | 4.5 | 69 | 1 |
| Vista | Cal/West Seeds | 4.5 | 34 | <1 |
| A-57 | Embros Seed Co. Inc. ^o | 4.4 | 12 | 6 |
| Glacier | Northrup, King & Co. | 4.4 | <1 | 1 |
| Atlas | North American Plant Breeders | 4.3 | 39 | 3 |
| Warrior | Northrup, King & Co. ⁱ | 4.3 | 20 | <1 |
| 131 | Cal/West Seeds ^b | 4.3 | 10 | 1 |
| Olympic | North American Plant Breeders ^c | 4.2 | 39 | 3 |
| WL 219 | Waterman-Loomis Co. | 4.2 | 27 | 9 |
| Vanguard | North American Plant Breeders ^e | 4.1 | 28 | 3 |
| Stride | Cal/West Seeds | 3.0 | 2 | 1 |

¹ 1978 seed suppliers: a. Cargill Seeds, b. DeKalb, c. Farmland Industries, d. Funk Seeds International, e. Interstate Seed and Grain Co., g. Land O'Lakes, Inc., h. Midland Cooperatives, Inc., i. Northrup, King & Co., j. P-A-G Seeds, k. Peterson Biddick, l. Peterson Forage Seed Div., m. Pioneer Hi-Bred International, Inc., n. Pride Company, Inc., o. Remy Seed Co., p. The Sexauer Company, q. Twin City Seed Co.

² Based on fall growth after cutting 1st week of September: 1 = tallest (least winterhardy), 9 = shortest.

³ Plants with little or no injury are classified as resistant.

ANNUAL CANARYGRASS



Plot borders lodge less than the centers in these annual canarygrass plots inspected by agronomist L.J. Smith. Consequently, plot borders are removed before harvesting the remaining areas to obtain yield data.

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

RECOMMENDED VARIETIES

Alden — Highest yielding variety and 11 percent above best common seed lot. Averaged 1300 pounds/acre in Stephen,

Crookston, and Rosemount trials. 65 days from planting to heading and 107 days to maturity. 34 inches tall. Test weight 47 pounds/bushel and seed weight .7 grams/100 seed. Fair to poor lodging resistance. Large heads with good shattering resistance. Developed cooperatively by Minnesota Agricultural Experiment Station and Minn-Dak Growers Association from P.I. 251390 from Iran. Released in 1973.

BARLEY

RECOMMENDED VARIETIES

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

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

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

OTHER VARIETIES

Beacon — Medium yield, Early, good resistance to lodging. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a malting variety by Malting Barley Improvement Association (MBIA). Resistant to prevalent leaf spotting diseases, stem rust and loose smut. Developed by North Dakota

Agricultural Experiment Station from a cross between Conquest and Dickson. Released in 1973.

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

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

Dickson — Medium-high yield. Medium lodging resistance. Kernel plumpness low. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a malting variety by MBIA. Resistant to leaf diseases, susceptible to loose smut. Developed by North Dakota Agricultural Experiment Station from crosses involving Traill, Kindred, and CI7117-77. Released in 1964.

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

Table 3. Yield of barley varieties in bushels per acre, 1971-1977

| Variety | Morris 9 ¹ | Crookston 10 | Stephen 5 | St. Paul 5 | Lamberton 4 | Average (33 trials) |
|---------|--------------------------|-----------------|--------------|---------------|----------------|------------------------|
| Beacon | 55 | 70 | 62 | 64 | 69 | 64 |
| Bonanza | 57 | 72 | 64 | 67 | 68 | 65 |
| Larker | 54 | 71 | 60 | 66 | 74 | 64 |
| Manker | 60 | 73 | 60 | 73 | 69 | 69 |
| LSD 5% | 5 | 4 | 3 | 6 | 6 | 2 |

¹ Number of trials.

Table 4. Characteristics of barley varieties

| Variety | Heading (June) | Height (inches) | Lodging (percent) | Protein (percent) ² | Plump kernels (percent) | Reactions to Disease ¹ | | |
|---------|-------------------|--------------------|----------------------|-----------------------------------|-------------------------------|-----------------------------------|---------------|----------------|
| | | | | | | Stem rust | Loose smut | Spot blotch |
| Beacon | 23 | 33 | 26 | 13.5 | 61 | R | R | R |
| Bonanza | 27 | 35 | 38 | 12.5 | 59 | R | R | S |
| Larker | 24 | 32 | 47 | 13.2 | 70 | R | S | S |
| Manker | 24 | 32 | 23 | 13.0 | 66 | R | S | R |

¹ R = resistant, S = susceptible. ² 14 percent moisture.

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.



Sheep on Carroll birdsfoot trefoil May 31; grazing can be delayed until midsummer.

Table 5. Average yields expressed as percentage of Empire for all tests in Minnesota 1967-77

| Variety | Developer | Yield (percent of Empire) | | | |
|-------------|---|---------------------------|-----|-----|---------|
| | | Year after seeding | | | Average |
| | | 1 | 2 | 3 | |
| Empire | New York Agr. Exp. Sta. (tons 15% DM hay/acre) | 3.1 | 3.2 | 3.0 | 3.1 |
| Leo | Macdonald College, Canada | 119 | 109 | 112 | 113 |
| Carroll | Iowa Agr. Exp. Sta. | 116 | 112 | 106 | 111 |
| Dawn | Missouri Agr. Exp. Sta. | 107 | 108 | 107 | 107 |
| Viking | New York Agr. Exp. Sta. | 109 | 105 | 95 | 103 |
| NK (N6-128) | Northrup, King & Co. | 100 | 100 | 99 | 100 |
| Maitland | Univ. of Guelph, Canada | 116 | 101 | 77 | 98 |
| Winnar | Soil Conservation Serv. | 100 | 86 | 88 | 91 |
| Tana | Montana Agr. Exp. Sta. | 92 | 95 | 74 | 87 |
| Mansfield | Vermont Agr. Exp. Sta. | 27 | 51 | 59 | 59 |

BROMEGRASS

Bromegrass is generally grown for hay in mixture with alfalfa or is used as pasture in mixture with other grasses and legumes. Present varieties can be classed as southern, intermediate, and northern types. Varieties of the southern type may not be higher yielding, but they are generally less susceptible to leaf diseases and earlier in maturity than northern types. Nearly all tested varieties

are of the southern type and are satisfactory in winterhardness. Some stand losses may occur when bromegrass is managed under a three-cut system.

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

Table 6. Dry matter yields of bromegrass varieties expressed as percentage of Fox at five locations, and average for 1966-1977

| Variety | Developer or owner ¹ | Crookston | Grand Rapids | Lamberton | Morris | Rosemount | Average |
|---------------------|---------------------------------------|-----------|--------------|-----------|------------------|------------------|---------|
| No. of trial years | | 2 | 4 | 1 | 2 | 6 | |
| <i>Fox ton/acre</i> | Minnesota Agr. Exp. Sta. ^c | 3.1 | 4.7 | 3.6 | 3.6 | 3.7 | 3.9 |
| Barton | Land O'Lakes-Felco | — | — | — | 102 ² | 111 ⁴ | 110 |
| Baylor | Rudy Patrick Co. ^b | 106 | 93 | 104 | 100 | 105 | 101 |
| Beacon | F.S. Services, Inc. | — | — | — | 93 ² | 113 ⁴ | 108 |
| Blair | Midland Coop. Inc. | 105 | 93 | 103 | 112 | 104 | 107 |
| Bromage | Americana Seed Co. | — | — | — | 96 ² | 105 ⁴ | 103 |
| Lincoln | Nebraska Agr. Exp. Sta. ^b | 97 | 89 | 98 | 98 | 97 | 95 |
| Sac | Wisconsin Agr. Exp. Sta. ^b | 102 | 92 | 99 | 95 | 107 | 100 |
| Saratoga | New York Agr. Exp. Sta. ^a | 103 | 102 | 105 | 105 | 100 ⁴ | 102 |
| Tempo | Agr. Canada, Ottawa ^a | — | — | — | — | 93 ³ | 93 |
| LSD 5% | | 15 | 9 | 12 | 11 | 6 | |

¹ Seed supplies: a. not available or very limited, b. available from several sources, c. Cenex.

² One year. ³ Two years. ⁴ Three years.

BUCKWHEAT

Buckwheat is cross-pollinated and very little certified seed is available. Consequently, variety designations may not be valid except for the few available certified seedlots. Since 1972, only Mancan, Pennquad, Tempest, and Tokyo have been certified in the United States. Trials at Elk River and Becker were conducted on infertile sandy soil; drought accounts for the low yields.

RECOMMENDED VARIETIES

Mancan — High yield. Large seed. Low test weight but good market acceptability. Selected by Agriculture Canada, Morden, from common buckwheat. Licensed in 1974.

VARIETIES NOT ADEQUATELY TESTED

Giant American — High yield. Large seed. Very low test weight.

OTHER VARIETIES

Common — Seedlots tested under this name ranged from low to high yield. Small or medium seed of high test weight.

Pennquad — Low yield. Very large seed. Low test weight. Good lodging resistance. Tetraploid so fields should probably be isolated from other varieties. Released by Pennsylvania Agricultural Experiment Station in 1966.

Tempest — Low yield. Small seed. High test weight. Poor lodging resistance. Continues bloom later than other varieties. Selected by Agriculture Canada from a Russian seedlot. Licensed in 1971.

Tokyo — Medium yield. Small to medium seed. High test weight. Originated by Agriculture Canada from a Japanese introduction. Released in 1955.



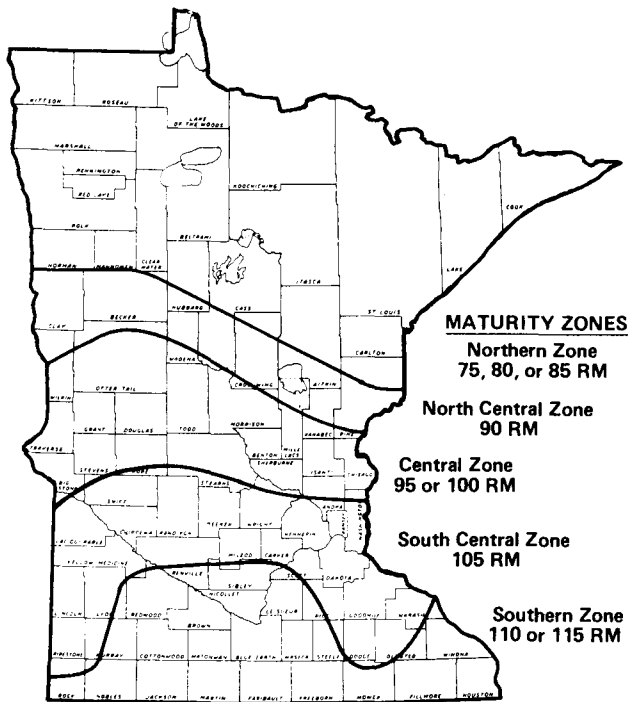
Buckwheat buyers, Mr. and Mrs. W.L. Cook, inspect variety plots at Becker. NSP's electricity generating plant is in the background.

Table 7. Characteristics of buckwheat varieties at Elk River in 1974-75 and at Becker in 1976-77

| Variety | Seed yield/acre (pounds) | Test weight/bushel (pounds) | Weight/100 seeds (grams) | Height (inches) | Lodging (score) ¹ | Planting to bloom (days) |
|----------------|--------------------------|-----------------------------|--------------------------|-----------------|------------------------------|--------------------------|
| Mancan | 801 | 42.3 | 3.1 | 40 | 4.4 | 29 |
| Giant American | 817 | 39.7 | 3.3 | 41 | 4.2 | 34 |
| Tempest | 594 | 46.8 | 2.3 | 41 | 5.4 | 32 |
| Tokyo | 787 | 45.8 | 2.5 | 40 | 4.2 | 32 |
| LSD 5% | 89 | | | | | |

¹ 1 = erect, 9 = flat.

CORN



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

The relative maturity ratings (RM) listed in table 8 correspond to zones of adaptation shown in the accompanying map. Yield and stalk breakage data reported in the table are from replicated, hand-harvested, single row plots. The plant population was approximately 21,000 plants per acre.

Table 8. Performance of corn hybrids

| Hybrid | Type of cross | Relative maturity | Yield/acre, 15.5% moisture (bushels) | | | | | Stalks broken below ear (percent) | | | | | | |
|----------------|---------------|-------------------|--------------------------------------|------------------------------|--------------------|--------------------|--------------------|-----------------------------------|------------------------|------------------------------|--------------------|--------------------|--------------------|--------------------|
| | | | Crooks-ton 1974-75, 77 | Staples ¹ 1975-77 | Morris 1972-75, 77 | Rose-mount 1975,77 | Lamber-ton 1975,77 | Waseca 1972-75, 77 | Crooks-ton 1974-75, 77 | Staples ¹ 1975-77 | Morris 1972-75, 77 | Rose-mount 1975,77 | Lamber-ton 1975,77 | Waseca 1972-75, 77 |
| Minhybrid 8301 | 3-way | 80 | 105 | 109 | 105 | | | 1 | 4 | 10 | | | | |
| Minhybrid 8201 | single | 80 | 112 | 115 | 109 ² | | | 3 | 5 | 12 ² | | | | |
| Minhybrid 7301 | 3-way | 90 | | 122 | 120 | 143 | 90 | 102 ³ | 1 | 6 | 7 | 3 | 8 ³ | |
| Minhybrid 6304 | 3-way | 95 | | | 115 ³ | 143 | 99 | 116 ⁶ | | 1 ³ | 12 | 5 | 2 ⁴ | |
| Minhybrid 6301 | 3-way | 95 | | | 121 | 142 | 100 | 122 | | 4 | 8 | 7 | 10 | |
| M309 | 3-way | 100 | | | 121 ⁴ | 161 | 117 | 112 ⁴ | | 5 ⁴ | 13 | 5 | 8 ⁴ | |
| Minhybrid 5301 | 3-way | 105 | | | 112 ⁵ | 149 ⁵ | 119 | 126 | | 8 ⁵ | 11 ⁵ | 2 | 15 | |
| Minhybrid 5201 | single | 105 | | | 131 ⁵ | 165 ⁵ | 124 | 136 | | 1 ⁵ | 24 ⁵ | 3 | 16 | |
| Minhybrid 4301 | 3-way | 110 | | | | | 111 | 111 ⁴ | | | | 3 | 7 ⁴ | |
| Minhybrid 4201 | single | 110 | | | | | 122 | 138 | | | | 3 | 9 | |
| Minhybrid 417 | double | 110 | | | | | 113 | 117 ³ | | | | 6 | 10 ³ | |
| LSD 5% | | | 7 | 9 | 5 | 7 | 9 | 9 | 3 | 3 | 6 | 5 | 4 | 6 |

¹ Irrigated.

² 1973-75,77.

³ 1974-75,77

⁴ 1975,77.

⁵ 1977.

DRY EDIBLE BEAN OR FIELD BEAN

Field bean is combine-harvested as mature dry bean. It is used for human food and reaches the grocer's shelf in either canned or dry form.

There are more than 15 market classes of dry, edible bean, but only eight have been grown commercially in Minnesota. Minnesota's 1976 production amounted to 32 percent navy, 66 percent pinto, 1 percent dark red kidney, and 1 percent great northern. Varietal recommendations are confined to varieties within the navy, small white, pinto, dark red kidney, black turtle soup, and great northern classes. Other classes such as pink are grown successfully, but important differences among varieties within their classes have not yet been identified in our trials. The only varieties described in the Not Adequately Tested and Other

Varieties groups are those of most current interest and availability.

RECOMMENDED VARIETIES

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

Emerson great northern — High yield. Medium-late maturity. Large, prostrate vine. Large white seed. Tolerant to bacterial wilt and moderately tolerant to bacterial blight. Susceptible to white mold and rust. Developed by Nebraska Agricultural Experiment

Station from a cross of GN 1140 and P.I. 165078. Released in 1971.

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

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

Snow-Bunting navy — Medium yield. Early. Medium-size bush. Small white seed. Reported resistant to common mosaic and root rot. Susceptible to white mold and common and fuscous blights. Developed by Clarence Muehlfeld (Bridgeport, Mich.)

from crosses involving Gratiot, Sanilac, Snow-Flake, and experimental navy strains. Released in 1974.

Snow-Flake navy — Medium yield. Early. Small erect bush. Small white seed. Reported resistant to common mosaic and fuscous blight. Susceptible to white mold and common blight. Developed by Clarence Muehlfeld (Bridgeport, Mich.) from crosses involving red kidney, Michelite, and experimental navy strains. Released in 1974.

T39 black turtle soup — Medium yield and maturity. Erect, viny bush. Small, black seed. Resistant to rust. Reported resistant to white mold. Susceptible to anthracnose. Selected from black turtle soup by California Agricultural Experiment Station.

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

Table 9. Characteristics of field bean varieties

| Class and variety | Seed yield/acre (pounds) | | | | | Average — 5 locations | | |
|--------------------------|--------------------------------|----------------------|-----------------------|----------------------|----------------------|------------------------|-----------------------------|------------------|
| | Becker ¹ 1976-77 | Lamberton 1974-77 | Morris 1974-75, 77 | Rosemount 1974-75 | Crookston 1974-77 | Yield/acre (pounds) | Weight/100 seeds (grams) | Mature (date) |
| Pinto | | | | | | | | |
| UI-114 | 2004 | 1433 | 1804 | 2022 | 1628 | 1778 | 38.4 | 9-4 |
| Columbia ² | 1673 | 1330 | 1345 | — | 850 | 1342 | 35.8 | 8-24 |
| Ouray ² | 1176 | 1025 | 953 | — | 398 | 931 | 38.2 | 8-24 |
| UI-111 | 1796 | 1332 | 1632 | 1529 | 1691 ³ | 1596 | 36.8 | 8-31 |
| Wyo 166 ² | 1961 | 1432 | 1602 | — | 1314 | 1620 | 38.3 | 8-31 |
| Navy | | | | | | | | |
| Seafarer | 1388 | 1049 | 1001 | 1383 | 813 | 1127 | 18.7 | 8-24 |
| Snow-Bunting | 1206 | 1267 | 974 | 1521 | 1241 | 1242 | 19.3 | 8-23 |
| Snow-Flake | 1209 | 1092 | 909 | 1267 | 1105 | 1116 | 19.4 | 8-22 |
| Up-Land | 1343 | 1247 | 1162 | 1359 | 1302 | 1283 | 18.4 | 8-27 |
| Charity | 1184 | 1296 | 1006 | 1476 | 1094 | 1211 | 21.4 | 8-26 |
| Fleetwood ² | 1600 | 1019 | 1246 | — | — | 1323 | 17.7 | 8-31 |
| Kentwood | 1339 | 1022 ³ | 1273 ³ | 1920 ³ | 472 ⁶ | 1205 | 24.6 | 9-6 |
| Purley King | 672 | 552 ² | 607 ² | — | — | 645 | 17.3 | 8-24 |
| Tuscola ⁴ | 1295 | 1193 | 1221 | — | — | 1271 | 19.5 | 9-6 |
| Small White | | | | | | | | |
| Aurora | 1920 | 1332 | 1335 | 1574 | 1489 ² | 1530 | 15.0 | 9-2 |
| Great Northern | | | | | | | | |
| Emerson | 2145 | 1566 | 1764 | 2163 | — | 1892 | 45.7 | 8-29 |
| Star ⁴ | 1911 | 1545 | 1737 | — | — | 1765 | 36.0 | 9-2 |
| UI-59 | 1713 | 1255 | 1621 | 1727 | — | 1562 | 33.4 | 9-1 |
| Valley | 1991 | 1556 | 1891 | 1991 | — | 1840 | 34.4 | 9-16 |
| Pink | | | | | | | | |
| Viva | 1562 | 1610 | 1643 | 1807 | — | 1638 | 26.0 | 9-3 |
| Dark Red Kidney | | | | | | | | |
| Montcalm | 1513 | 877 | 1239 | 1423 | 675 ⁶ | 1145 | 46.6 | 9-4 |
| Black Turtle Soup | | | | | | | | |
| Black Turtle T39 | 1728 | 1479 ⁴ | 1297 ⁴ | — | 1385 ² | 1515 | 19.1 | 8-28 |
| Black Turtle Commercial | 1334 | 1232 ³ | 1295 ³ | 1675 ³ | 1389 ² | 1400 | 20.3 | 8-31 |
| Black Turtle S.V.C. | 1493 | 1187 ⁴ | 1022 ⁴ | — | 973 ² | 1211 | 18.8 | 8-31 |
| Jamapa | 1500 | 1088 ⁴ | 1035 ⁴ | — | 627 ² | 1105 | 19.9 | 9-2 |
| Cranberry | | | | | | | | |
| Michicran ⁵ | 2138 | 1102 | 1105 | 1592 | — | 1467 | 48.1 | 9-9 |
| UI-50 ² | 1272 | 919 | 1097 | — | — | 1130 | 44.9 | 8-26 |
| UI-51 ² | 707 | 626 | 476 | — | — | 637 | 36.6 | 8-22 |
| Miscellaneous | | | | | | | | |
| Adzuki | 1956 | 976 ² | 1112 ² | 1521 ² | 0 ² | 1113 | 18.2 | 9-24 |
| LSD 5% | 357 | 172 | 252 | 252 | 139 | 110 | | |

¹ Irrigated. ² Not tested in 1974-76. ³ Not tested in 1974. ⁴ Not tested in 1974-75. ⁵ Not tested in 1976. ⁶ Not tested in 1974, 1976-77.

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

OTHER VARIETIES

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

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

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

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



Agronomist L.J. Smith between rows of a bean variety dwarfed by chlorosis. Pinto bean plants in the next three rows are healthy.

DRY EDIBLE PEA AND FIELD PEA

Dry edible pea is 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, it usually is sown in a mixture with oat.

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

RECOMMENDED VARIETIES

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

VARIETIES NOT ADEQUATELY TESTED

Campbell Scotch — Low yield. Very early. Medium vine length. Medium size, green seed. More resistant to seed bleaching than any green variety tested at Becker in 1976. Selected from crosses involving Alaska, Delwiche Early Scotch, and Thomas Laxton. Released by the Campbell Institute for Agricultural Research of Davis, CA and Camden, NJ in 1971.

CEB 102 — High yield. Early. Very short. Very large, green seed. Developed by Cebeco-Handelsraad of The Netherlands.

Fenn — High yield. Very late. Long vined. Small, dark mottled

seed. Not marketable as an edible pea but satisfactory for feed. Selected from Austrian Winter by the Idaho Agricultural Experiment Station. Released in 1971.

Finale — Very high yield. Early. Very short. Very large, green seed. Developed by Cebeco-Handelsraad of The Netherlands.

Paloma — Very high yield. Early. Very short. Large, cream-colored seed. Developed by Cebeco-Handelsraad of The Netherlands.

OTHER VARIETIES

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

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

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

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

Table 10. Characteristics of pea varieties at Becker, 1976-77

| Variety | Seed yield/acre (pounds) | | | Weight/100 seeds (grams) | Seed protein (percent) ¹ | First bloom (date) | Mature (date) | Vine length (inches) |
|----------------------|--------------------------|-----------|---------|-----------------------------|--|-----------------------|------------------|-------------------------|
| | Dryland | Irrigated | Average | | | | | |
| Century | 877 | 1673 | 1275 | 22.6 | 25.8 | 6-4 | 7-15 | 31 |
| Campbell Scotch | 435 | 1117 | 776 | 18.4 | 25.9 | 5-19 | 6-24 | 19 |
| Finale | 723 | 2210 | 1467 | 27.8 | 25.5 | 5-28 | 7-6 | 11 |
| Latah | 628 | 1464 | 1046 | 18.4 | 26.0 | 5-25 | 6-30 | 27 |
| Paloma | 890 | 2108 | 1499 | 25.4 | 25.5 | 5-29 | 7-5 | 12 |
| LSD 5% | 101 | 270 | 144 | | | | | |
| CEB 102 ² | 820 | 2114 | 1467 | 28.9 | 25.4 | 5-28 | 7-6 | 12 |
| Fenn ² | 936 | 2979 | 1958 | 10.9 | 27.0 | 6-12 | 7-22 | 31 |
| Trapper ² | 811 | 1695 | 1253 | 12.5 | 26.3 | 6-2 | 7-11 | 24 |

¹ Oven-dry.

² Not tested in 1976.

FLAX

RECOMMENDED VARIETIES

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

Dufferin — High yield when sown early, *not recommended for late sowing*. Very late, brown seed, blue flowers, variable plant height. High oil percent. Resistant to rust and wilt. Licensed in 1975 by Agriculture Canada, Ottawa from a cross of Redwood 65 and FP 441.

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

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

OTHER VARIETIES

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

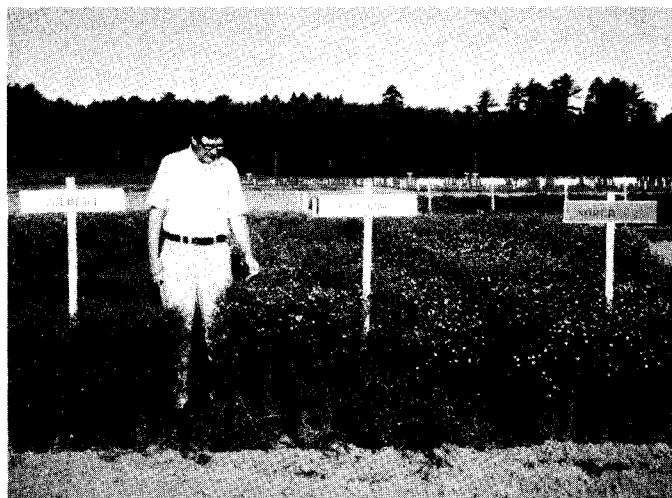
B-5128 — Medium yield but low in yield when sown late. Late, brown seed, blue flowers. Medium oil percent, low iodine value. Susceptible to rust, moderately susceptible to both wilt and pasmo. Contains a mixture of types including a small percentage of yellow-seeded plants and rust-resistant plants. Released in 1943 by North Dakota Agricultural Experiment Station from a cross of Golden and Rio.

Foster — Low yield, especially when sown late. Medium-late, yellow seed, dark blue flowers. Very high oil percent, medium

iodine value. Immune to rust, moderately resistant to wilt and pasmo. Released in 1969 by North Dakota Agricultural Experiment Station from a cross of C.I. 1665 and Minerva.

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

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



Entomologist J.A. Lofgren examines flax varieties for leafhoppers that spread the disease, aster yellows.

Table 11. Yields of flax varieties in bushels per acre, 1975-77

| Variety | Early-sown | | | | | | Late-sown | | | |
|----------|---------------------|----------------------|-------------------|----------------------|--------------------|--------------------|----------------------|-------------------|-------------------|--------------------|
| | St. Paul 1976-77 | Lamberton 1975-77 | Morris 1975,77 | Crookston 1975-77 | Stephen 1976-77 | Average 1975-77 | Lamberton 1975,77 | Morris 1975,77 | Crookston 1975 | Average 1975,77 |
| Culbert | 28 | 23 | 32 | 25 | 32 | 27 | 30 | 21 | 12 | 23 |
| Dufferin | 26 | 23 | 34 | 27 | 33 | 28 | 19 | 19 | 17 | 18 |
| Linott | 27 | 23 | 29 | 27 | 32 | 27 | 29 | 20 | 17 | 23 |
| Norstar | 29 | 21 | 29 | 27 | 31 | 27 | 21 | 20 | 15 | 20 |
| Nored | 28 | 20 | 30 | 26 | 31 | 26 | 18 | 19 | 19 | 18 |
| LSD 5% | 3 | 2 | 3 | 2 | 3 | 1 | 3 | 4 | 5 | 2 |

Table 12. Characteristics of flax varieties, 1975-77

| Variety | Days from sowing to | | Height (inches) | Weight/1000 seeds (grams) | Lodging (score) ¹ | Chlorosis (score) ¹ | Wilt (score) ¹ | Rust ² | Oil (percent) ³ |
|----------|---------------------|---------------|--------------------|---------------------------------|---------------------------------|-----------------------------------|------------------------------|-------------------|-------------------------------|
| | First bloom | Full bloom | | | | | | | |
| Culbert | 43 | 49 | 22 | 5.5 | 1.6 | 4.0 | 1.0 | R | 41.7 |
| Dufferin | 49 | 57 | 25 | 5.0 | 1.6 | 1.3 | 3.2 | R | 41.6 |
| Linott | 42 | 48 | 22 | 4.8 | 1.8 | 3.0 | 7.3 | R | 41.0 |
| Norstar | 47 | 54 | 25 | 4.8 | 2.6 | 1.6 | 3.7 | MS | 40.5 |
| Nored | 47 | 55 | 26 | 5.5 | 1.5 | 2.6 | 3.5 | S | 40.5 |

¹ 1 = best, 9 = poorest. ² R = resistant, MS = moderately susceptible, S = susceptible. ³ Oven-dry.

GRAIN SORGHUM

Agronomist J.H. Ford between short grain sorghum and tall sweet sorghum hybrids. Grain sorghum is grown for grain and sweet sorghum for silage.



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

Trials were planted between May 21 and June 3 at the rate of 150,000 seeds per acre in rows 30 inches apart. Sorghum was harvested when it was dry enough to combine but not dry enough to store without artificial drying. Consequently, these trials do not measure lodging that might occur during natural drying in the field. All hybrids were harvested the same day for relative moisture comparisons. Hybrids in the table are ranked from earliest to latest based on head moisture at harvest.

Table 13. Characteristics of grain sorghum hybrids at Lamberton, 1972-77

| Hybrid and originator | Years of trial | Grain yield/acre (pounds) ¹ | | Head moisture ² (percent) | | Test weight/ bushel ² (pounds) | Weight/ 100 seeds ² (grams) | Planting to heading (days) | Height (inches) |
|-----------------------|----------------|--|------|--------------------------------------|-----------|---|--|----------------------------|-----------------|
| | | 1972-77 ² | 1977 | September 14 | October 3 | | | | |
| 52, Northrup, King | 1973-77 | 3924 | 4396 | 33.3 | 20.7 | 55.6 | 1.7 | 59 | 38 |
| 1, Minnesota | 1972-77 | 4058 | 3902 | 28.4 | 20.8 | 56.0 | 2.3 | 58 | 54 |
| RS 455, Minnesota | 1972-77 | 4896 | 5666 | 33.3 | 21.7 | 57.1 | 2.5 | 62 | 54 |
| M51, Trojan | 1977 | 5099 | 5565 | 37.9 | 22.2 | 57.2 | 2.3 | 77 | 42 |
| R-920, Acco | 1972,75-77 | 4783 | 5267 | 38.1 | 22.6 | 56.6 | 1.9 | 64 | 48 |
| 121, Northrup, King | 1972-77 | 4505 | 5129 | 35.9 | 22.9 | 55.7 | 2.1 | 65 | 44 |
| 894, Pioneer | 1972-77 | 4595 | 4868 | 37.3 | 22.9 | 57.0 | 2.0 | 65 | 40 |
| 8901, Pioneer | 1972-77 | 4332 | 4969 | 38.4 | 23.0 | 52.1 | 2.0 | 65 | 42 |
| G-251A, Funk | 1977 | 3723 | 4189 | 36.4 | 23.5 | 57.2 | 1.8 | 65 | 37 |
| 200, Pride | 1975-77 | 3272 | 3528 | 32.3 | 23.6 | 53.9 | 2.2 | 58 | 44 |
| B-38+, DeKalb | 1977 | 5346 | 5812 | 42.5 | 24.1 | 57.4 | 2.3 | 70 | 41 |
| M54, Trojan | 1977 | 5277 | 5743 | 39.1 | 24.3 | 57.9 | 2.4 | 70 | 50 |
| 1580, Northrup, King | 1976-77 | 5113 | 5645 | 40.1 | 24.6 | 56.8 | 2.2 | 68 | 45 |
| A-28+, DeKalb | 1977 | 5037 | 5503 | 49.2 | 25.1 | 56.1 | 2.2 | 68 | 43 |
| A25a, DeKalb | 1975-77 | 4968 | 5311 | 41.3 | 25.4 | 55.2 | 2.4 | 66 | 37 |
| 33A, Jacques | 1976-77 | 4912 | 5775 | 43.8 | 25.4 | 57.9 | 2.2 | 70 | 45 |
| 129, Northrup, King | 1973-77 | 5343 | 5793 | 40.0 | 25.5 | 58.6 | 2.5 | 67 | 46 |
| 500A, Pride | 1977 | 5037 | 5503 | 39.0 | 26.0 | 57.0 | 2.8 | 64 | 50 |
| 101, Jacques | 1976-77 | 4691 | 5412 | 41.5 | 26.1 | 56.2 | 2.4 | 68 | 45 |
| 202, Jacques | 1977 | 5396 | 5862 | 41.2 | 26.4 | 58.7 | 2.2 | 73 | 49 |
| GR 26, Garnett-Ross | 1977 | 4986 | 5452 | 41.2 | 27.2 | 56.1 | 2.5 | 68 | 43 |
| 180, Northrup, King | 1972-77 | 5002 | 5652 | 43.8 | 27.5 | 57.7 | 2.1 | 70 | 48 |
| X-0244, Acco | 1977 | 5004 | 5470 | 41.3 | 29.1 | 59.1 | 2.1 | 71 | 43 |
| B-35, DeKalb | 1977 | 5876 | 6342 | 47.4 | 30.3 | 56.6 | 2.2 | 74 | 50 |
| LSD 5% | | 342 | 589 | 2.3 | 1.3 | | | | |

¹ Oven-dry. ² 1974 data not used because birdfeeding loss affected varietal comparisons.

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.

Introduced from Russia by U.S. Department of Agriculture in 1903.

RECOMMENDED VARIETIES

FORAGE

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

GRAIN

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

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

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

Turghai — Red proso. Very early. Medium height. Good lodging resistance. Medium size, orange seed of high test weight.

OTHER VARIETIES

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

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

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

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

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

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

Table 14. Characteristics of foxtail millet varieties at Rosemount, 1974-76

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

¹ Oven-dry.

² 1 = erect, 9 = flat.

Table 15. Grain yields of proso millet varieties in pounds per acre

| Variety | Rosemount 1974-77 | Elk River-Becker 1974-77 | Grand Rapids 1976-77 | Lamberton 1976-77 | Morris 1977 | Average (5 locations) |
|---------|-------------------|--------------------------|----------------------|-------------------|-------------|-----------------------|
| Dawn | 3385 | 1853 | 1888 | 2543 | 1631 | 2260 |
| Minco | 3637 | 1793 | 1349 | 1966 | 2187 | 2186 |
| Cerise | 2983 | 1801 | 1478 | 1974 | 2065 | 2060 |
| Turghai | 2925 | 1695 | 1331 | 1989 | 2406 | 2069 |
| Snobird | 3020 | 1476 | 1132 | 2070 | 2321 | 2004 |
| LSD 5% | 277 | 176 | 217 | 284 | 380 | 123 |

Table 16. Characteristics of proso millet varieties, 1974-77

| Variety | Planting to heading (days) | Planting to maturity (days) | Lodging (score) ¹ | Height (inches) | Weight/100 seeds (grams) | Test weight/bushel (pounds) |
|---------|----------------------------|-----------------------------|------------------------------|-----------------|--------------------------|-----------------------------|
| Dawn | 48 | 80 | 2.5 | 31 | .66 | 52.1 |
| Minco | 51 | 92 | 2.7 | 37 | .62 | 52.8 |
| Cerise | 48 | 79 | 2.6 | 37 | .58 | 56.2 |
| Turghai | 47 | 80 | 1.8 | 37 | .55 | 55.9 |
| Snobird | 50 | 90 | 3.2 | 37 | .66 | 52.9 |

¹ 1 = erect, 9 = flat.

OAT

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

RECOMMENDED VARIETIES

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

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

Lyon — Medium-late maturity, high yield, tall, good lodging resistance, high test weight and groat percentage, medium protein content, white seed. Resistant to crown rust and smut. Selected at the Minnesota Agricultural Experiment Station from a cross between Lodi and Portage. Released in 1977.

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

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

VARIETIES NOT ADEQUATELY TESTED

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



Erect Lang oat at the left contrast with the lodged variety being examined by agronomist R.L. Thompson.

OTHER VARIETIES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Table 17. Yield of oat varieties in bushels per acre 1975-77

| Variety | Rosemount | Waseca | Lamberton ¹ | Crookston | Grand Rapids | Average | Morris ² |
|-------------------|-----------|--------|------------------------|-----------|--------------|---------|---------------------|
| Lang ³ | 112 | 101 | 113 | 106 | 85 | 103 | — |
| M73 | 95 | 104 | 90 | 87 | 76 | 90 | 97 |
| Stout | 99 | 113 | 104 | 99 | 76 | 98 | 102 |
| Chief | 99 | 110 | 93 | 95 | 73 | 94 | 98 |
| Noble | 98 | 110 | 108 | 109 | 81 | 101 | 104 |
| Spear | 100 | 104 | 112 | 100 | 77 | 98 | 106 |
| Lyon | 99 | 100 | 108 | 106 | 80 | 98 | 100 |
| Froker | 103 | 99 | 104 | 98 | 76 | 96 | 98 |
| Lodi | 105 | 103 | 105 | 105 | 79 | 99 | 105 |
| Dal | 100 | 100 | 92 | 92 | 78 | 93 | 88 |
| Hudson | 107 | 109 | 96 | 123 | 90 | 105 | 95 |
| LSD 5% | 7 | 10 | 9 | 6 | 8 | 4 | |

¹ 1975, 1977. ² 1975. ³ 1976-77.

Table 18. Characteristics of oat varieties, 1975-77

| Variety | Heading (June) | Height (inches) | Lodging (score) ¹ | Test weight/bushel (pounds) | Groat (percent) | Protein percent ² | | Protein/acre (pounds) | Reactions to disease ³ | |
|---------|----------------|-----------------|------------------------------|-----------------------------|-----------------|------------------------------|------|-----------------------|-----------------------------------|------|
| | | | | | | groat | seed | | Crown rust | Smut |
| Lang | 16 | 32 | 1.1 | 40 | 74 | 17.4 | 12.6 | 406 | S | S |
| M73 | 16 | 36 | 2.9 | 40 | 76 | 18.8 | 14.0 | 411 | S | MS |
| Stout | 16 | 30 | 1.7 | 40 | 76 | 17.4 | 12.9 | 406 | MR | S |
| Chief | 17 | 35 | 2.5 | 40 | 76 | 18.3 | 13.8 | 400 | S | S |
| Noble | 17 | 32 | 2.0 | 41 | 73 | 18.1 | 13.2 | 427 | S | R |
| Spear | 17 | 34 | 2.2 | 40 | 75 | 19.4 | 14.4 | 452 | S | S |
| Lyon | 20 | 39 | 2.2 | 41 | 75 | 18.6 | 13.9 | 439 | MR | R |
| Froker | 21 | 37 | 2.8 | 42 | 76 | 17.8 | 13.3 | 414 | S | S |
| Lodi | 22 | 41 | 2.7 | 40 | 74 | 18.0 | 13.3 | 428 | S | MS |
| Dal | 23 | 37 | 2.6 | 41 | 75 | 19.8 | 14.8 | 447 | R | R |
| Hudson | 24 | 36 | 3.7 | 37 | 74 | 16.9 | 12.4 | 417 | R | S |

¹ 1 = erect, 5 = flat.

² 8 percent moisture.

³ R = resistant, MR = moderately resistant, MS = moderately susceptible, and S = susceptible.

ORCHARDGRASS

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

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

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



Lack of winterhardiness is a major problem with orchardgrass. The varieties on each side of agronomist N.P. Martin differ in winter survival.

Table 19. Characteristics of orchardgrass varieties with dry matter yields expressed as percentage of Hallmark at three locations, 1971-1977

| Variety | Developer or owner ¹ | Yield (percent of Hallmark) | | | | Winter survival ² | | Rust reaction ³ |
|-----------------|--|-----------------------------|--------|-----------|---------|------------------------------|-----------|----------------------------|
| | | Grand Rapids | Morris | Rosemount | Average | Grand Rapids | Rosemount | |
| | No. of trial years | 7 | 3 | 5 | | | | |
| Early | | | | | | | | |
| Boone | Kentucky Agr. Exp. Sta. | 85 | — | 96 | 90 | — | 4.8 | MS |
| Chinook | Agr. Canada, Lethridge ^a | 83 | 81 | 85 | 83 | — | 4.5 | — |
| Medium | | | | | | | | |
| Able | Farmers Forage Res. Coop. ^c | 90 | — | 93 | 91 | 1.0 | — | MS |
| Dart | Land O'Lakes-Felco | 103 | — | 94 | 100 | 1.3 | — | S |
| Dayton | Midland Coop. Inc. | 93 | — | 97 | 95 | — | — | S |
| Frode | Swedish Seed Assoc. ^d | 94 | 89 | 92 | 92 | — | — | — |
| Grassage | Americana Seed Co. | 100 | — | 101 | 100 | 1.3 | — | — |
| Hallmark | | | | | | | | |
| <i>ton/acre</i> | Farmers Forage Res. Coop. ^e | 3.6 | 3.0 | 3.8 | 3.5 | 1.5 | 4.8 | S |
| Ina | Ontario Agr. Coll., Guelph ^a | 90 | — | 89 | 89 | — | 3.3 | MS |
| Juno | Agr. Canada, Ottawa ^a | 100 | — | 98 | 100 | 1.0 | — | S |
| Napier | Rudy Patrick Co. ^b | 100 | — | 95 | 98 | 1.5 | 3.8 | MS |
| Comet | Northrup, King & Co. ^a | 98 | — | 94 | 97 | 1.7 | 2.3 | S |
| Ox-1 | North American Plant Breeders ^a | 100 | — | 94 | 99 | 1.7 | — | — |
| Sterling | Iowa Agr. Exp. Sta. ^e | 98 | 103 | 93 | 97 | 1.5 | 4.9 | S |
| Late | | | | | | | | |
| Kay | Agr. Canada, Ottawa ^a | 92 | — | 88 | 90 | 3.7 | — | — |
| Majestic | Maple Leaf Mills, Inc. ^a | — | — | 91 | 93 | — | — | — |
| LSD 5% | | 9 | 9 | 9 | | | | |

¹ Seed supplies: a. not available or very limited, b. available from several sources, c. Cenex, d. Northrup, King & Co., e. Land O'Lakes-Felco, f. seed sale regulated by U.S. Variety Protection Act.

² 1 = most damaged, 9 = least damaged, 1977.

³ MS = moderately susceptible, S = susceptible.

⁴ Two years.

RED CLOVER

Red clover can be seeded in pure stands or with timothy for hay or silage. It is more easily established in pasture renovation than either alfalfa or trefoil. Historically, winterhardy varieties have not persisted beyond two crop years because of susceptibility to crown rot and other disease. Some of the new varieties may persist for 3

years. Red clover should not be seeded with alfalfa for hay because red clover seedlings are more aggressive than alfalfa seedlings and may prevent alfalfa from becoming established. Red clover is better adapted to acid soils than alfalfa, but where alfalfa can be grown successfully it will yield more than red clover.

Table 20. Average yields of red clover expressed as percentage of Lakeland for all tests in Minnesota 1966-1977

| Variety | Developer or owner ¹ | Yield (percent of Lakeland) | | | | Stand 3 years after seeding (percent) |
|-----------|--|-----------------------------|-----|-----|-------------|---------------------------------------|
| | | Year after seeding | | | Average | |
| | | 1 | 2 | 3 | 1st 2 years | |
| Lakeland | Wisconsin Agr. Exp. Sta. & USDA ^{abcefghij} (tons 15% DM hay/acre) | 3.6 | 3.5 | 1.8 | 3.5 | 55 |
| Arlington | Wisconsin Agr. Exp. Sta. & USDA ^{bceffij} | 122 | 102 | 100 | 118 | 85 |
| Florex | Northrup, King & Co. ^d | 130 | — | — | — | — |
| Prosper I | Pride Co. Inc. ^g | 116 | — | — | — | — |
| Dollard | Macdonald College, Canada | 104 | 91 | 97 | 100 | 23 |
| Kenstar | Kentucky Agr. Exp. Sta. & USDA | 101 | 95 | 88 | 99 | 63 |
| Redman | Farmers Forage Res. Coop. | 96 | 97 | 89 | 95 | 70 |
| Redland | Illinois Agr. Exp. Sta. ^a | 96 | 91 | 81 | 95 | 55 |
| Kenland | Kentucky Agr. Exp. Sta. & USDA | 98 | 90 | 68 | 94 | 38 |
| Pennscott | Pennsylvania Agr. Exp. Sta. | 96 | 71 | 0 | 89 | 28 |
| Florie | Northrup, King & Co. | 85 | — | — | — | — |
| Tensar | Louisiana Agr. Exp. Sta. | 56 | 62 | 0 | 59 | 23 |

¹ 1978 seed suppliers: a. Interstate Seed and Grain Co., b. Land O'Lakes, Inc., c. Midland Cooperatives, Inc., d. Northrup, King, and Co., e. Peterson Biddick, f. Peterson Forage Seed Div., g. Pride Company Inc., h. Remy Seed Co., i. The Sexauer Company, j. Twin City Seed Co.

REED CANARYGRASS

Reed canarygrass is adapted throughout Minnesota for use as hay, pasture, or silage. It is one of the best grass species for use on poorly drained soil, in swampy areas, and in areas subject to spring flooding. The species is also well adapted to upland soils. The seedling vigor is not as good as that of other commonly used forage grasses. Reed canarygrass is less palatable than most species seeded for hay and pasture, but cattle will produce well on the grass if it is used before it becomes mature. Satisfactory

pasture utilization occurs if the grass is grazed when it is between 6 and 24 inches tall. Harvesting hay between heading and early bloom is preferred, because the quality declines with advanced maturity. The varieties tested are winterhardy and persistent.

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

Table 21. Dry matter yields of reed canarygrass varieties expressed as percentage of Rise at four locations and average for 1972-77

| Variety | Developer or owner ¹ | Heading | Lamberton | Grand Rapids | Morris | Rosemount | Average |
|---------------|---------------------------------------|---------|-----------|------------------|--------|-----------------|---------|
| | No. of trial years | | 2 | 4 | 2 | 5 | |
| Rise ton/acre | Rudy Patrick Co. ^b | Medium | 2.9 | 4.6 | 3.2 | 4.2 | 4.0 |
| Castor | Agr. Canada, Beaverlodge ^a | Medium | 91 | 92 ² | 96 | 96 ² | 94 |
| Flare | Land O'Lakes-Felco | Medium | — | 102 ² | — | 96 ² | 99 |
| Frontier | Agr. Canada, Ottawa ^{c,d} | Medium | 96 | 99 | 101 | 96 | 98 |
| Grove | Agr. Canada, Ottawa ^a | Late | — | 89 | 82 | 91 | 88 |
| Vantage | Iowa Agr. Exp. Sta. ^e | Medium | 96 | 102 | 102 | 101 | 101 |
| LSD 5% | | | 10 | 5 | 5 | 3 | |

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

SOYBEAN

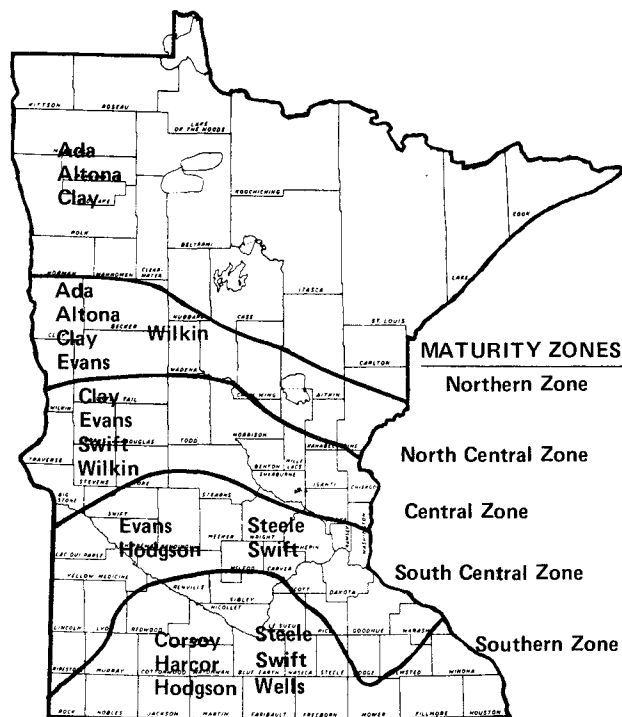
Information on soybean is presented in two sections. The first section deals with varieties that have been developed and released by publicly supported institutions and that are considered for recommendation by the Minnesota Agricultural Experiment Station. The second section deals primarily with privately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

PUBLICLY DEVELOPED VARIETIES

Yield data reported in table 22 are averages of two or more years. The data for Crookston, Moorhead, Morris, St. Paul, Lamberton, and Waseca are from replicated combine-harvested plots. Data from Grand Rapids, the Sand Plain, and Fairmont are from replicated multiple-row nursery plots. The Sand Plain plots were at Elk River in 1974 and 1975 and at Becker in 1976 and 1977 and were irrigated. The row spacing was 24 inches at Grand Rapids; 28 in 1972 and 1973 and 22 in 1974 through 1977 at Crookston; and 22 in 1972, 1974, and 1976, and 28 in 1973, 1975, and 1977 at Moorhead. At all other locations the spacing was 30 inches. At all locations, seeding rate was about 10 viable seeds per foot of row. The majority of the tests in all years were planted from May 5 to May 30. However, the early plantings at Waseca and Lamberton were usually during the last week of April. A mid-June planting also was made at Lamberton and Waseca in 1975, 1976, and 1977.

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

Data on maturity, lodging resistance, plant height, seed size, and seed quality in table 23 are from locations suited to particular maturity groups. Phytophthora reactions were determined by



University of Minnesota's Department of Plant Pathology. Chlorosis scores were obtained from plantings at Crookston and on a high-lime soil near Lamberton. Protein and oil determinations were made at the U.S. Regional Soybean Laboratory, Urbana, Illinois.

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

Table 22. Yields of publicly developed soybean varieties in bushels per acre

| Variety | Crookston 1972-77 | Grand Rapids 1970-77 | Moorhead 1974-77 | Morris 1975-77 | Sand Plain ¹ 1974-77 | St. Paul 1975-77 | Lamberton | | | Waseca | | | Fairmont 1976-77 |
|-------------------------------|----------------------|----------------------------|---------------------|-------------------|---------------------------------------|---------------------|------------------------------|--------------------------------|---------------------------------|------------------------------|--------------------------------|---------------------------------|---------------------|
| | | | | | | | Early planting 1976-77 | Mid-May planting 1976-77 | Mid-June planting 1975-77 | Early planting 1976-77 | Mid-May planting 1976-77 | Mid-June planting 1975-77 | |
| Early-maturing group | | | | | | | | | | | | | |
| Fiskeby V | | 19 | | | | | | | | | | | |
| Ada | 22 | 28 | 20 | 21 | | | | | | | | | |
| Altona | 22 | 30 | 20 | 22 | | | | | | | | | |
| Clay | 26 | 31 | 25 | 24 | | | | | | | | | |
| Wilkin | 26 | 32 | 23 | 24 | | | | | | | | | |
| LSD 5% | 2 | 2 | 2 | 3 | | | | | | | | | |
| Medium-maturing group | | | | | | | | | | | | | |
| Clay | | | 23 | 22 | 45 | 33 | | | 28 | | | 37 | |
| Wilkin | | | | | 43 | | | | | | | | |
| Evans | | | 26 | 26 | 52 | 38 | | 35 | 30 | | 39 | 38 | 39 |
| Grande | | | | 26 | 51 | 36 | | 33 | | | 36 | | 38 |
| Harlon | | | | 28 | 51 | 34 | | 34 | | | 41 | | 42 |
| Swift | | | | 29 | 51 | 35 | | 29 | 31 | | 41 | 36 | 38 |
| Hodgson | | | | 30 | 55 | 37 | | 38 | 34 | | 46 | 38 | 42 |
| Steele | | | | 28 | 50 | 34 | | 32 | 32 | | 42 | 35 | 40 |
| Hodgson + Steele ² | | | | | | | | 36 | | | 44 | | 40 |
| LSD 5% | | | 3 | 3 | 3 | 2 | | 3 | 3 | | 2 | 2 | 3 |
| Late-maturing group | | | | | | | | | | | | | |
| Hodgson | | | | | | | 36 | 35 | 34 | 45 | 44 | 38 | 44 |
| Coles | | | | | | | 34 | 34 | | 43 | 45 | | 42 |
| Corsoy | | | | | | | 37 | 36 | 32 | 45 | 45 | 35 | 39 |
| Harcor | | | | | | | 40 | 35 | | 45 | 45 | | 41 |
| Wells | | | | | | | 35 | 35 | 30 | 44 | 43 | 33 | 42 |
| Corsoy + Wells ² | | | | | | | | 35 | | | 44 | | 40 |
| LSD 5% | | | | | | | 2 | 4 | 3 | 2 | 3 | 2 | 5 |

¹ Irrigated.² 1:1 blend.

RECOMMENDED VARIETIES

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

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

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

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

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

by U.S. Variety Protection Act.

Harcor — Southern zone. Similar to Corsoy in yield but slightly later and lodges more. Resistant to phytophthora. Should be used only in southern half of southern zone, and on heavy soils where phytophthora is a hazard. Developed at Agriculture Canada, Harrow, Ontario from crosses involving Corsoy and Harsoy 63. Licensed in 1975.

Hodgson — South central and southern zones. Outstanding in yield in its maturity class. Good resistance to lodging. Tolerant to high-lime soils. High oil content. Susceptible to phytophthora. Developed at Minnesota Agricultural Experiment Station from crosses involving Corsoy, Lincoln, Richland, and P.I. 180501. Released in 1974. Seed sale regulated by U.S. Variety Protection Act.

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

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

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

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

VARIETIES NOT ADEQUATELY TESTED

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

OTHER VARIETIES

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

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

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

Chippewa and Chippewa 64 — Chippewa was selected at the U.S. Regional Soybean Laboratory from crosses involving Lincoln and Richland. The phytophthora-resistant Chippewa 64 was developed by backcrosses in which Chippewa was the recurrent parent and Blackhawk was the resistant, non-recurrent parent. Chippewa and Chippewa 64 were very important in Minnesota

soybean production for two decades. Recently they have been superseded by higher yielding varieties. Chippewa was released in 1955, Chippewa 64 in 1964.

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

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

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

Harlon — Similar to Evans in yield but several days later and lodges more. Resistant to phytophthora. Developed at Agriculture Canada, Harrow, Ontario from a cross of Blackhawk and Harosoy 63. Licensed in 1975.

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

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

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

Traverse — Similar to Chippewa 64 in yield but several days earlier. Susceptible to chlorosis on high-lime soils. Highly susceptible to phytophthora. Developed at Minnesota Agricultural Experiment Station from a cross of Lincoln and Ottawa Mandarin. Released in 1965.

Table 23. Characteristics of publicly developed soybean varieties

| Variety | Mature (date) | Lodging (score) ¹ | Height (inches) | Weight/100 seeds (grams) | Seed quality (score) ¹ | Protein (percent) ² | Oil (percent) ² | Phytophthora (reaction) ³ | Chlorosis (score) ¹ | Flower (color) ⁴ | Pubescence (color) ⁴ | Hilum (color) ⁴ |
|--|---------------|------------------------------|-----------------|--------------------------|-----------------------------------|--------------------------------|----------------------------|--------------------------------------|--------------------------------|-----------------------------|---------------------------------|----------------------------|
| Early-maturing group (average of Crookston and Grand Rapids, 1974-77) | | | | | | | | | | | | |
| Fiskeby V | 8-31 | 1.0 | 20 | 14.5 | 2.2 | — | — | S | 2.5 | P | T | Br |
| Ada | 9-14 | 1.9 | 30 | 15.8 | 2.9 | 40.7 | 19.0 | R | 1.4 | W | G | Y |
| Altona | 9-15 | 1.9 | 28 | 17.2 | 2.9 | 40.1 | 18.3 | R | 2.1 | P | T | Bl |
| Clay | 9-19 | 1.6 | 27 | 15.2 | 2.8 | 39.6 | 21.0 | S | 1.3 | P | G | Y |
| Wilkin | 9-20 | 1.2 | 29 | 13.6 | 2.7 | 39.5 | 20.0 | R | 1.3 | W | G | Y |
| Medium-maturing group (average of Morris and St. Paul, 1975-77)⁵ | | | | | | | | | | | | |
| Clay | 9-3 | 1.7 | 25 | 16.6 | 2.7 | 39.2 | 22.2 | S | 1.0 | P | G | Y |
| Wilkin | 9-3 | 1.2 | 25 | 14.9 | 2.7 | 39.1 | 21.1 | R | 1.0 | W | G | Y |
| Evans | 9-8 | 1.5 | 33 | 15.4 | 2.4 | 38.5 | 21.8 | R | 1.2 | W | G | Y |
| Grande | 9-14 | 2.4 | 29 | 21.2 | 3.0 | 37.4 | 20.6 | S | 1.6 | P | T | Y |
| Harlon | 9-16 | 2.2 | 36 | 15.6 | 2.3 | 37.8 | 21.3 | R | 1.6 | W | G | Y |
| Swift | 9-16 | 3.1 | 34 | 15.4 | 2.3 | 37.2 | 21.1 | S | 1.0 | W | T | Bl |
| Hodgson | 9-20 | 2.2 | 33 | 15.4 | 2.2 | 38.2 | 21.5 | S | 1.2 | P | G | Bf |
| Steele | 9-20 | 2.2 | 36 | 17.0 | 2.6 | 39.6 | 20.4 | R | 2.2 | P | G | Y |
| Late-maturing group (average of Lamberton and Waseca, 1976-77) | | | | | | | | | | | | |
| Hodgson | 9-13 | 1.6 | 32 | 15.6 | 1.7 | 39.1 | 22.1 | S | 1.5 | P | G | Bf |
| Coles | 9-20 | 2.2 | 38 | 17.0 | 2.0 | 41.5 | 19.1 | S | 2.0 | P | G | Y |
| Corsoy | 9-21 | 2.5 | 38 | 14.5 | 1.8 | 40.0 | 20.4 | S | 2.2 | P | G | Y |
| Harcor | 9-22 | 2.6 | 39 | 14.0 | 2.0 | 39.7 | 20.4 | R | 1.5 | P | G | Y |
| Wells | 9-21 | 1.5 | 38 | 15.0 | 2.2 | 41.5 | 20.3 | R | 2.0 | P | G | lb |

¹ 1=excellent, 5=very poor. ² Moisture-free; no 1977 data. ³ R=resistant, S=susceptible. ⁴ Flower color: P=purple, W=white; pubescence color: G=gray, T=tawny; hilum color: BF=buff, Bl=black, Br=brown, lb=imperfect black, Y=yellow. ⁵ No Morris date in 1976.

PRIVATELY DEVELOPED VARIETIES

A group of varieties considered "early" by the companies submitting them was planted in replicated tests at Becker, Morris, and Rosemount in 1976 and 1977. A later group was planted at Fairmont, Lambertson, and Waseca in 1975, 1976 and 1977. The Morris and Lambertson tests were not harvested in 1976 because of drought. Irrigation water was applied to the Rosemount and Becker tests in 1976 and to the Becker test in 1977.

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

Yields of the early group of varieties for 1977 and for longer periods are given in table 24. Yields for the late group are given in table 25. The varieties are arranged in two sections with the publicly developed varieties first and the privately developed varieties second. Each section is arranged alphabetically.

Other characteristics for 1977 are given in tables 26 and 27 for the late and early groups, respectively. For several of the characteristics, an average is shown for both locations within a group. The phytophthora reactions are from laboratory tests made by the Department of Plant Pathology.

The companies entering varieties in the 1977 Minnesota tests along with mailing addresses are as follows: ACCO Seed, P.O. Box 9, Belmond IA 50421; Americana Seeds, Inc., Research Central, R.R. 1, Clinton WI 53525; Asgrow Seed Co., P.O. Box 1059, Des Moines IA 50053; Dale Ewing Farm Seeds, Box 322, Jewell, IA 50130; FFR Cooperative, 4112 E. State Road 225, West Lafayette, IN 47906; Funk Seeds International 1300 W. Washington St., Bloomington, IL 61701; Jacques Seed Co., Prescott, WI 54021; Kruger Seed Co., R.R. 4, Cedar Falls, IA 50613; Land O'Lakes, Inc., Answer Farm, R.R. 2, Webster City, IA 50595; North American Plant Breeders, R.R. 2, New Highway

30 East, Ames, IA 50010; Northrup, King and Co., P.O. Box 49, Washington, IA 52353; Peterson Soybean Seed Division, Pioneer Hi-Bred International, Inc., 3261 West Airline Highway, Waterloo, IA 50701; Pfizer Genetics, Inc., Box 99, Beaman, IA 50609; Pride Co., Glen Haven, WI 53810; and Soybean Research Foundation, P.O. Box 72, 115 N. Perry St., Mason City, IL 62664.



Minnesota's highest yielding soybean variety trial is conducted on irrigated sandy soil at Becker. Agronomist J.W. Lambert at the field day last July.

Table 24. Yields of private soybean varieties in bushels per acre, early group, 1977 and period averages

| Company | Brand and/or variety | Becker ¹ | | Morris 1977 | Rosemount | | Average 1977 |
|------------------------------|----------------------|---------------------|---------|-------------|-----------|---------|--------------|
| | | 1977 | 1976-77 | | 1977 | 1976-77 | |
| | Evans | 45 | 45 | 35 | 42 | 46 | 42 |
| | Harlon | 48 | 45 | 36 | 42 | 43 | 42 |
| | Hodgson | 57 | 52 | 36 | 44 | 48 | 46 |
| | Swift | 52 | 50 | 36 | 36 | 42 | 41 |
| ACCO Seed Co. | Ex. 101 | 48 | | 34 | 41 | | 41 |
| Americana Seeds, Inc. | A105 | 49 | | 25 | 33 | | 36 |
| Americana Seeds, Inc. | A111 | 50 | | 33 | 36 | | 40 |
| Americana Seeds, Inc. | XK110 | 49 | | 39 | 33 | | 40 |
| Asgrow Seed Co. | A1564 | 51 | 49 | 34 | 41 | 45 | 42 |
| FFR Cooperative | FFR 1117 | 48 | | 31 | 38 | | 39 |
| Funk Seeds, Int'l. | Beechwood (G-3030) | 35 | | 24 | 33 | | 31 |
| Jacques Seed Co. | J94A | 50 | | 33 | 38 | | 40 |
| Land O'Lakes, Inc. | LL4501 | 44 | | 33 | 43 | | 40 |
| N.A. Plant Breeders | Ex. 111 | 52 | | 35 | 42 | | 43 |
| N.A. Plant Breeders | Ex. 112 | 48 | | 33 | 42 | | 41 |
| Northrup, King and Co. | Multivar 31 | 51 | | 35 | 39 | | 42 |
| Pioneer Hi-Bred Int'l., Inc. | Peterson 0877 | 50 | | 35 | 48 | | 44 |
| Pioneer Hi-Bred Int'l., Inc. | Peterson 1677 | 57 | | 32 | 42 | | 43 |
| Pioneer Hi-Bred Int'l., Inc. | Peterson 118-11 | 56 | 47 | 27 | 43 | 42 | 42 |
| Pfizer Genetics, Inc. | CX155 | 54 | | 27 | 44 | | 42 |
| Pfizer Genetics, Inc. | CX282 | 47 | | 33 | 39 | | 40 |
| Pfizer Genetics, Inc. | E23-14 | 52 | | 26 | 34 | | 37 |
| | LSD 5% | 5 | 4 | 4 | 7 | 5 | 3 |

¹ Irrigated.

Table 25. Yields of private varieties in bushels per acre, late group, 1977 and period averages

| Company | Brand and/or variety | Fairmont | | | Lamberton | | Waseca | | | Average 1977 |
|------------------------------|----------------------|----------|---------|---------|-----------|----------|--------|---------|---------|--------------|
| | | 1977 | 1976-77 | 1975-77 | 1977 | 1975, 77 | 1977 | 1976-77 | 1975-77 | |
| | Corsoy | 38 | 36 | 44 | 40 | 38 | 55 | 49 | 50 | 44 |
| | Harcor | 35 | 38 | 44 | 42 | 41 | 51 | 48 | 48 | 43 |
| | Hodgson | 39 | 43 | 48 | 42 | 37 | 55 | 53 | 51 | 45 |
| | Wells | 42 | 43 | 48 | 39 | 39 | 54 | 46 | 49 | 45 |
| ACCO Seed Co. | Ex. 101 | 36 | | | 38 | | 48 | | | 41 |
| ACCO Seed Co. | Ex. 201 | 36 | 40 | | 44 | | 55 | 47 | | 45 |
| Americana Seeds, Inc. | A105 | 47 | | | 35 | | 46 | | | 43 |
| Americana Seeds, Inc. | A111 | 40 | | | 41 | | 52 | | | 44 |
| Americana Seeds, Inc. | A141 | 40 | | | 41 | | 48 | | | 43 |
| Americana Seeds, Inc. | A207 | 42 | | | 42 | | 50 | | | 45 |
| Asgrow Seed Co. | A1564 | 38 | 39 | | 38 | | 41 | 41 | | 39 |
| Asgrow Seed Co. | A2440 | 35 | 39 | 47 | 43 | 43 | 53 | 49 | 51 | 44 |
| Asgrow Seed Co. | A2575 | 38 | 40 | | 44 | | 55 | 49 | | 46 |
| Asgrow Seed Co. | A2656 | 44 | 41 | | 46 | | 55 | 51 | | 49 |
| Dale Ewing Farm Seeds | DE444 | 37 | | | 40 | | 54 | | | 44 |
| Dale Ewing Farm Seeds | Mora-Soy 45 | 38 | | | 42 | | 50 | | | 43 |
| Dale Ewing Farm Seeds | Mora-Soy 55 | 41 | 41 | | 44 | | 53 | 50 | | 46 |
| Dale Ewing Farm Seeds | Mora-Soy 55R | 38 | | | 44 | | 50 | | | 44 |
| Dale Ewing Farm Seeds | Mora-Soy 66 | 33 | | | 41 | | 54 | | | 43 |
| FFR Cooperative | FFR 224 | 47 | | | 42 | | 46 | | | 45 |
| FFR Cooperative | FFR 1050 | 51 | | | 41 | | 47 | | | 46 |
| FFR Cooperative | FFR 1117 | 33 | | | 38 | | 43 | | | 38 |
| Funk Seed Int'l. | NAIRN(G-3122) | 31 | | | 33 | | 39 | | | 34 |
| Jacques Seed Co. | J98 | 36 | 38 | 45 | 43 | 40 | 58 | 50 | 50 | 46 |
| Jacques Seed Co. | J102 | 35 | 37 | | 40 | | 47 | 45 | | 41 |
| Jacques Seed Co. | J104 | 34 | 39 | 44 | 44 | 41 | 54 | 49 | 47 | 44 |
| Kruger Seed Co. | DeSoy 222A | 33 | 36 | 44 | 39 | 38 | 54 | 48 | 50 | 42 |
| Kruger Seed Co. | DeSoy 333A | 39 | | | 45 | | 55 | | | 46 |
| Kruger Seed Co. | DeSoy 555R | 39 | | | 47 | | 52 | | | 46 |
| Kruger Seed Co. | K-464 | 35 | 34 | | 40 | | 49 | 42 | | 41 |
| Kruger Seed Co. | K-1005 | 40 | | | 44 | | 51 | | | 45 |
| Land O'Lakes, Inc. | Go-44 | 38 | 41 | 45 | 40 | 39 | 54 | 50 | 51 | 44 |
| Land O'Lakes, Inc. | LL4401 | 38 | | | 40 | | 44 | | | 41 |
| Land O'Lakes, Inc. | LL4402 | 33 | | | 40 | | 50 | | | 41 |
| N.A. Plant Breeders | Agripro 14 | 35 | 38 | 47 | 41 | 41 | 51 | 48 | 50 | 42 |
| N.A. Plant Breeders | Agripro 18 | 34 | 38 | | 40 | | 53 | 48 | | 42 |
| N.A. Plant Breeders | NAPB Ex. 111 | 37 | | | 40 | | 49 | | | 42 |
| N.A. Plant Breeders | NAPB Ex. 112 | 31 | | | 36 | | 43 | | | 36 |
| Northrup, King and Co. | Multivar 41 | 35 | | | 43 | | 49 | | | 43 |
| Northrup, King and Co. | S1244 | 36 | 40 | 41 | 38 | 38 | 48 | 46 | 45 | 41 |
| Pioneer Hi-Bred Int'l., Inc. | Peterson 118-11 | 34 | 37 | 43 | 38 | 38 | 49 | 44 | 46 | 40 |
| Pioneer Hi-Bred Int'l., Inc. | Peterson 1677 | 37 | | | 45 | | 58 | | | 47 |
| Pioneer Hi-Bred Int'l., Inc. | Peterson 2477 | 43 | | | 42 | | 54 | | | 46 |
| Pioneer Hi-Bred Int'l., Inc. | Peterson 3100 | 37 | 38 | 44 | 39 | 37 | 58 | 50 | 49 | 45 |
| Pfizer Genetics, Inc. | CX114 | 35 | 36 | 40 | 39 | 34 | 52 | 47 | 47 | 42 |
| Pfizer Genetics, Inc. | CX155 | 39 | | | 46 | | 55 | | | 47 |
| Pfizer Genetics, Inc. | CX175 | 40 | | | 43 | | 54 | | | 45 |
| Pfizer Genetics, Inc. | CX282 | 35 | 38 | | 33 | | 45 | 42 | | 38 |
| Pfizer Genetics, Inc. | E23-14 | 36 | | | 39 | | 51 | | | 42 |
| Pride Co., Inc. | B186 | 35 | 37 | 43 | 41 | 37 | 47 | 44 | 45 | 41 |
| Pride Co., Inc. | PK105 | 34 | | | 41 | | 48 | | | 41 |
| Soybean Res. Foundation | SRF150 | 29 | 36 | 42 | 45 | 38 | 51 | 48 | 48 | 41 |
| Soybean Res. Foundation | SRF150P | 27 | | | 43 | | 51 | | | 40 |
| Soybean Res. Foundation | SRF200 | 39 | 37 | 42 | 41 | 38 | 54 | 45 | 47 | 44 |
| LSD 5% | | 8 | 6 | 5 | 6 | 5 | 7 | 5 | 4 | 4 |

Table 26. Characteristics of private soybean varieties, late group, average Fairmont, Lamberton and Waseca, 1977

| Company | Brand and/or variety | Mature (date) | Lodging (score) ¹ | Height (inches) | Weight/100 seeds (grams) | Chlorosis (score) ¹ | Phytophthora (reaction) ² | Flower (color) ³ | Pubescence (color) ³ | Hilum (color) ³ |
|-----------------------------|----------------------|---------------|------------------------------|-----------------|--------------------------|--------------------------------|--------------------------------------|-----------------------------|---------------------------------|----------------------------|
| | Corsoy | 9-17 | 2.9 | 37 | 16.6 | 2.8 | S | P | G | Y |
| | Harcor | 9-18 | 3.0 | 36 | 15.8 | 3.0 | R | P | G | Y |
| | Hodgson | 9-8 | 2.0 | 29 | 16.4 | 1.5 | S | P | G | Bf |
| | Wells | 9-18 | 2.2 | 37 | 17.4 | 3.0 | R | P | G | Ib |
| ACCO Seed Co. | Ex. 101 | 9-5 | 2.0 | 32 | 16.1 | 2.8 | R | P | G | Ib |
| ACCO Seed Co. | Ex. 201 | 9-15 | 2.3 | 34 | 17.9 | 3.0 | H | M | M | M |
| Americana Seeds, Inc. | A105 | 9-30 | 2.1 | 39 | 18.4 | 4.5 | H | W | T | Bl |
| Americana Seeds, Inc. | A111 | 9-9 | 1.8 | 32 | 16.2 | 2.8 | H | P | G | Y |
| Americana Seeds, Inc. | A141 | 9-9 | 2.1 | 35 | 18.5 | 4.0 | S | P | T | Br |
| Americana Seeds, Inc. | A207 | 9-16 | 1.8 | 33 | 18.9 | 4.2 | S | W | T | Br |
| Asgrow Seed Co. | A1564 | 9-7 | 1.8 | 34 | 16.3 | 2.0 | R | P | G | Y |
| Asgrow Seed Co. | A2440 | 9-16 | 2.6 | 35 | 15.6 | 3.0 | H | P | G | Y |
| Asgrow Seed Co. | A2575 | 9-16 | 1.8 | 37 | 17.5 | 1.5 | R | P | G | Y |
| Asgrow Seed Co. | A2656 | 9-20 | 3.0 | 37 | 18.4 | 1.5 | R | P | G | Ib |
| Dale Ewing Farm Seeds | DE444 | 9-18 | 2.7 | 35 | 18.8 | 4.0 | H | P | G | M |
| Dale Ewing Farm Seeds | Mora-Soy 45 | 9-8 | 2.0 | 31 | 16.6 | 3.0 | H | P | G | Bf |
| Dale Ewing Farm Seeds | Mora-Soy 55 | 9-16 | 2.9 | 36 | 16.1 | 3.5 | H | P | G | Y |
| Dale Ewing Farm Seeds | Mora-Soy 55R | 9-17 | 2.9 | 38 | 16.1 | 3.0 | R | P | G | Y |
| Dale Ewing Farm Seeds | Mora-Soy 66 | 9-16 | 2.2 | 35 | 16.8 | 3.5 | H | P | G | M |
| FFR Cooperative | FFR 224 | 10-2 | 3.0 | 34 | 18.2 | 3.8 | R | P | T | Bl |
| FFR Cooperative | FFR 1050 | 10-2 | 2.6 | 34 | 18.0 | 3.0 | R | P | T | Bl |
| FFR Cooperative | FFR 1117 | 9-8 | 2.1 | 30 | 16.8 | 5.0 | R | P | G | Y |
| Funk Seed Int'l. | NAIRN(G-3122) | 8-29 | 2.2 | 29 | 16.5 | 1.8 | R | W | G | Y |
| Jacques Seed Co. | J98 | 9-14 | 2.3 | 35 | 16.0 | 3.2 | S | P | G | Y |
| Jacques Seed Co. | J102 | 9-16 | 2.3 | 36 | 16.2 | 3.2 | S | P | G | Y |
| Jacques Seed Co. | J104 | 9-16 | 2.6 | 36 | 16.9 | 2.0 | S | P | G | Y |
| Kruger Seed Co. | DeSoy 222A | 9-8 | 1.9 | 30 | 16.6 | 1.8 | H | P | G | Bf |
| Kruger Seed Co. | DeSoy 333A | 9-15 | 2.7 | 36 | 16.2 | 3.0 | S | P | G | Y |
| Kruger Seed Co. | DeSoy 555R | 9-20 | 3.1 | 38 | 16.5 | 3.2 | R | P | G | M |
| Kruger Seed Co. | K464 | 9-18 | 2.2 | 35 | 18.6 | 2.2 | R | P | G | Ib |
| Kruger Seed Co. | K-1005 | 9-18 | 2.1 | 37 | 17.3 | 3.0 | S | W | G | Y |
| Land O'Lakes, Inc. | Go-44 | 9-15 | 2.2 | 35 | 16.4 | 3.0 | S | P | G | Y |
| Land O'Lakes, Inc. | LL4401 | 9-12 | 3.2 | 30 | 15.1 | 2.0 | H | P | G | Ib |
| Land O'Lakes, Inc. | LL4402 | 9-14 | 2.2 | 28 | 18.5 | 3.0 | R | P | T | Bl |
| N.A. Plant Breeders | Agripro 14 | 9-12 | 1.9 | 32 | 18.2 | 3.8 | H | M | M | M |
| N.A. Plant Breeders | Agripro 18 | 9-14 | 2.1 | 34 | 16.3 | 3.2 | S | M | M | M |
| N.A. Plant Breeders | NAPB Ex. 111 | 9-6 | 1.6 | 31 | 16.0 | 2.0 | R | P | G | Y |
| N.A. Plant Breeders | NAPB Ex. 112 | 9-8 | 1.9 | 31 | 16.1 | 2.8 | R | P | G | Ib |
| Northrup, King and Co. | Multivar 41 | 9-10 | 1.7 | 32 | 16.7 | 3.0 | H | P | G | M |
| Northrup, King and Co. | S1244 | 9-7 | 2.3 | 32 | 18.4 | 3.8 | S | P | T | Bl |
| Pioneer Hi-Bred Int'l, Inc. | Peterson 118-11 | 9-10 | 2.2 | 30 | 16.1 | 2.8 | S | P | T | Br |
| Pioneer Hi-Bred Int'l, Inc. | Peterson 1677 | 9-10 | 1.7 | 31 | 15.0 | 1.8 | S | P | G | Y |
| Pioneer Hi-Bred Int'l, Inc. | Peterson 2477 | 9-18 | 2.3 | 37 | 17.2 | 3.0 | S | P | G | Y |
| Pioneer Hi-Bred Int'l, Inc. | Peterson 3100 | 9-16 | 2.2 | 35 | 16.9 | 2.0 | H | P | G | M |
| Pfizer Genetics, Inc. | CX114 | 9-16 | 2.4 | 34 | 16.3 | 1.8 | H | W | G | M |
| Pfizer Genetics, Inc. | CX155 | 9-14 | 2.2 | 35 | 15.6 | 3.0 | S | P | G | Y |
| Pfizer Genetics, Inc. | CX175 | 9-15 | 2.6 | 35 | 16.6 | 2.8 | S | P | G | Y |
| Pfizer Genetics, Inc. | CX282 | 9-2 | 2.0 | 32 | 15.9 | 2.8 | S | P | T | Bl |
| Pfizer Genetics, Inc. | E23-14 | 9-17 | 3.2 | 35 | 20.3 | 3.8 | H | W | G | Y |
| Pride Co., Inc. | B186 | 9-6 | 1.9 | 33 | 16.4 | 4.5 | S | P | T | Br |
| Pride Co., Inc. | PK105 | 9-10 | 1.8 | 32 | 17.0 | 3.8 | H | P | G | M |
| Soybean Res. Foundation | SRF150 | 9-14 | 2.0 | 33 | 15.1 | 4.8 | S | P | G | Y |
| Soybean Res. Foundation | SRF150P | 9-16 | 1.6 | 33 | 15.4 | 4.5 | R | P | G | Y |
| Soybean Res. Foundation | SRF200 | 9-20 | 2.8 | 39 | 16.4 | 3.8 | R | P | G | Y |

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

Table 27. Characteristics of private soybean varieties, early group, average Becker, Morris, and Rosemount, 1977

| Company | Brand and/or variety | Mature (date) | Lodging (score) ¹ | Height (inches) | Weight/100 seeds (grams) | Chlorosis (score) ¹ | Phytophthora (reaction) ² | Flower (color) ³ | Pubescence (color) ³ | Hilum (color) ³ |
|-----------------------------|----------------------|---------------|------------------------------|-----------------|--------------------------|--------------------------------|--------------------------------------|-----------------------------|---------------------------------|----------------------------|
| | Evans | 9-9 | 2.4 | 32 | 15.8 | 1.0 | R | W | G | Y |
| | Harlon | 9-15 | 2.9 | 34 | 16.1 | 2.2 | R | W | G | Y |
| | Hodgson | 9-22 | 2.9 | 34 | 16.4 | 1.5 | S | P | G | Bf |
| | Swift | 9-15 | 3.4 | 33 | 15.9 | 1.2 | S | W | T | Bl |
| ACCO Seed Co. | Ex. 101 | 9-20 | 2.9 | 36 | 16.3 | 2.8 | R | P | G | lb |
| Americana Seeds, Inc. | A105 | 10-13 | 3.8 | 41 | 16.0 | 4.5 | H | W | T | Bl |
| Americana Seeds, Inc. | A111 | 9-23 | 2.9 | 37 | 16.7 | 2.8 | H | P | G | Bf |
| Americana Seeds, Inc. | XK110 | 9-19 | 3.1 | 37 | 15.4 | 2.8 | S | W | G | Y |
| Asgrow Seed Co. | A1564 | 9-22 | 3.0 | 34 | 16.6 | 2.0 | R | P | G | Y |
| FFR Cooperative | FFR1117 | 9-22 | 2.6 | 33 | 17.2 | 5.0 | R | P | G | Y |
| Funk Seeds, Int'l | Beechwood (G-3030) | 9-5 | 3.4 | 30 | 17.7 | 1.5 | R | W | T | Bl |
| Jacques Seed Co. | J94A | 9-22 | 2.9 | 36 | 15.9 | 2.0 | S | W | T | T |
| Land O'Lakes, Inc. | LL4501 | 9-9 | 2.4 | 34 | 13.6 | 1.5 | R | W | G | Bf |
| N.A. Plant Breeders | Ex. 111 | 9-20 | 2.8 | 32 | 16.0 | 2.0 | R | P | G | Y |
| N.A. Plant Breeders | Ex. 112 | 9-21 | 3.3 | 34 | 16.2 | 2.8 | R | P | G | lb |
| Northrup, King and Co. | Multivar 31 | 9-16 | 3.3 | 33 | 16.0 | 1.8 | H | M | M | M |
| Pioneer Hi-Bred Int'l, Inc. | Peterson 0877 | 9-14 | 2.6 | 30 | 18.0 | 2.5 | H | P | G | M |
| Pioneer Hi-Bred Int'l, Inc. | Peterson 1677 | 9-27 | 3.1 | 34 | 15.0 | 1.8 | S | P | G | Y |
| Pioneer Hi-Bred Int'l, Inc. | Peterson 118-11 | 9-29 | 3.1 | 31 | 18.1 | 2.8 | S | P | T | Br |
| Pfizer Genetics, Inc. | CX155 | 10-3 | 3.5 | 38 | 15.7 | 3.0 | S | P | G | Y |
| Pfizer Genetics, Inc. | CX282 | 9-14 | 2.9 | 34 | 16.0 | 2.8 | S | P | T | B1 |
| Pfizer Genetics, Inc. | E23-14 | 10-6 | 4.2 | 37 | 18.6 | 3.8 | H | M | G | Y |

¹ 1 = excellent, 5 = very poor. ² H = heterogeneous, R = resistant, S = susceptible. ³ Flower color: P = purple, W = white, M = mixed; pubescence color: G = gray, T = tawny, M = mixed; hilum color: Bf = buff, Bl = black, Br = brown, lb = imperfect black, T = tan, M = mixed.

SUNFLOWER

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

Most seed planted in 1978 will by hybrid seed that was produced by the cytoplasmic male-sterility and genetic fertility-restoration method. Names for open-pedigree hybrids in this report are based on the last digits of the parents' names. Single crosses are named from the last two digits of the female's name and the last digit of the male's name; for example, cms HA 89 X RHA 274 is called 894. For a three-way cross, the last digit of the

second parent's name is also shown; for example, (cms HA 89 X HA 234) X RHA 274 is called 8944.

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

Varieties averaged about 5.5 feet tall. Maximum differences among varieties rarely exceeded 1.5 feet. Consequently, varietal differences in height were not economically important.

Varieties of high self-compatibility are more likely to produce high yields than are varieties of low self-compatibility if there is a shortage of insect pollinators.



Commercial agronomist G.N. Fick places bags over sunflower heads to control pollination. Fick, a former USDA agronomist and U of M graduate, developed many of the parental lines used in public and commercial sunflower hybrids.

Table 28. Characteristics of sunflower varieties

| Variety and originator | Years of trial | Seed yield/acre (pounds) | | | | Averages – Crookston, Morris, Rosemount, Lamberton | | | | | | |
|------------------------|----------------|--------------------------|--------------------|-----------------------|------|--|----------------------------|--------------------------|-----------------------------|--------------------------|---|------------------------------|
| | | Crookston 1974-77 | Morris 1974-75, 77 | Averages ¹ | | Large seed (percent) ² | Oil (percent) ³ | Weight/100 seeds (grams) | Test weight/bushel (pounds) | Planting to bloom (days) | Self compatibility (percent) ⁴ | Disease ratings ⁵ |
| Nonoilseed varieties | | | | | | | | | | | | |
| Sundak, USDA | 1974-77 | 1943 | 1472 | 1741 | 2392 | 26 | 29.9 | 10.8 | 27.1 | 73 | 51 | R-S-S |
| 853, USDA | 1976 | 1757 | — | — | — | 12 | — | 9.4 | 31.4 | 70 | 77 | R-R-S |
| 860, USDA | 1974-77 | 2174 | 2277 | 2218 | 2405 | 50 | — | 12.5 | 26.8 | 72 | 100 | R-S-S |
| 862, USDA | 1974-77 | 2144 | 1713 | 1959 | 2442 | 10 | — | 9.9 | 28.1 | 71 | 87 | R-S-S |
| 863, USDA | 1976 | 1927 | — | — | — | 5 | — | 8.0 | 28.0 | 73 | 75 | R-R-S |
| 883, USDA | 1976-77 | 1628 | 2103 | 1832 | 2268 | 4 | — | 9.4 | 27.1 | 69 | 53 | R-R-S |
| 920, USDA | 1976 | 2305 | — | — | — | 38 | — | 10.8 | 26.0 | 72 | 77 | R-S-S |
| 923, USDA | 1976-77 | 2185 | 2407 | 2280 | 2595 | 15 | — | 9.6 | 25.9 | 71 | 89 | R-R-S |
| 924, USDA | 1977 | 2642 | 1930 | 2337 | 2625 | 26 | — | 11.4 | 27.2 | 69 | 79 | R-R-S |
| D-508, Dahlgren | 1975-77 | 2078 | 2352 | 2195 | 2163 | 5 | — | 9.7 | 28.8 | 67 | 32 | R-S-S |
| D-715, Dahlgren | 1976-77 | 2345 | 1886 | 2148 | 2370 | 9 | — | 10.4 | 27.7 | 71 | 39 | R-S-S |
| Royal Circle 6, Agway | 1975, 77 | 1859 | 1484 | 1698 | 2041 | 11 | — | 10.1 | 26.8 | 72 | 38 | R-S-S |
| Royal Circle 7, Agway | 1975, 77 | 1619 | 1462 | 1552 | 1932 | 26 | — | 11.6 | 26.1 | 73 | 46 | R-S-S |
| Oilseed varieties | | | | | | | | | | | | |
| Peredovik, U.S.S.R. | 1974-77 | 1722 | 1877 | 1788 | 2143 | 0 | 45.3 | 6.2 | 30.1 | 73 | 9 | MS-S-MS |
| Sputnik 71, U.S.S.R. | 1974-77 | 1898 | 1900 | 1899 | 2385 | 0 | 48.5 | 6.2 | 31.8 | 72 | 14 | MS-S-MS |
| Vochod, U.S.S.R. | 1977 | 1519 | 1733 | 1611 | 1965 | 0 | 50.1 | 5.7 | 31.1 | 71 | 2 | MS-S-MS |
| Saturn, Canada | 1977 | 1262 | 2007 | 1581 | 1973 | 0 | 45.6 | 5.8 | 32.1 | 69 | 9 | MS-S-MS |
| Airelle, France | 1977 | 2215 | 1126 | 1748 | 2009 | 0 | 42.3 | 5.4 | 28.6 | 74 | 22 | — S — |
| Clarisol, France | 1977 | 2041 | 1615 | 1858 | 2167 | 0 | 44.4 | 4.7 | 32.6 | 72 | 5 | — — — |
| 241, USDA | 1975-77 | 2334 | 2294 | 2317 | 2555 | 0 | 47.4 | 5.2 | 34.6 | 72 | 81 | MR-R-R |
| 891, USDA | 1974-77 | 1894 | 2089 | 1978 | 2298 | 0 | 47.8 | 5.1 | 34.3 | 73 | 44 | MR-R-R |
| 893, USDA | 1974-77 | 2154 | 1923 | 2055 | 2399 | 0 | 48.2 | 5.0 | 34.8 | 72 | 65 | MR-R-R |
| 894, USDA | 1974-77 | 2128 | 2050 | 2095 | 2336 | 0 | 46.0 | 4.5 | 33.9 | 72 | 91 | MR-R-R |
| 903, USDA | 1974-77 | 2150 | 2367 | 2243 | 2699 | 0 | 46.0 | 5.8 | 34.7 | 70 | 46 | R-R-R |
| 904, USDA | 1974-77 | 2050 | 2392 | 2197 | 2384 | 0 | 44.0 | 5.3 | 34.0 | 71 | 63 | R-R-R |
| 908, USDA | 1974-77 | 1563 | 2374 | 1911 | 2307 | 0 | 46.8 | 5.6 | 33.8 | 73 | 27 | R-R-R |
| 8903, USDA | 1975-77 | 1987 | 2337 | 2137 | 2561 | 0 | 47.5 | 5.3 | 34.9 | 72 | 33 | R-R-R |
| 8943, USDA | 1975, 77 | 2316 | 2220 | 2275 | 2445 | 0 | 46.2 | 5.5 | 34.9 | 71 | 50 | R-R-R, S |
| 8944, USDA | 1974-77 | 1966 | 2259 | 2092 | 2419 | 0 | 44.4 | 5.2 | 35.1 | 70 | 66 | MR-R-R, S |
| 204, Cargill | 1975-77 | 2040 | 2055 | 2046 | 2444 | 0 | 45.3 | 4.5 | 33.6 | 72 | 100 | MR-R-R |
| Sun-Hi 104, P.O.I. | 1977 | 2276 | 2282 | 2279 | 2618 | 0 | 45.0 | 5.2 | 34.2 | 69 | 8 | MR-R-R |
| Sun-Hi 301A, P.O.I. | 1977 | 1960 | 2402 | 2149 | 2520 | 0 | 47.5 | 4.9 | 35.7 | 72 | 21 | MR-R-R |
| Sun-Hi 304, P.O.I. | 1974-77 | 2134 | 1946 | 2053 | 2140 | 0 | 45.2 | 4.6 | 33.8 | 73 | 70 | MR-R-R |
| Sun-Hi 304A, P.O.I. | 1977 | 1852 | 2012 | 1921 | 2271 | 0 | 45.7 | 4.5 | 34.8 | 73 | — | MR-R-R |
| Sun-Hi 310, P.O.I. | 1977 | 1997 | 2185 | 2078 | 2430 | 0 | 47.4 | 5.0 | 35.5 | 74 | 29 | MR-R-R |
| Sun-Gro 372A, G.S.A. | 1977 | 2063 | 2318 | 2172 | 2529 | 0 | 47.4 | 4.8 | 33.4 | 76 | 83 | R-S-R |
| Sun-Gro 380, G.S.A. | 1975-77 | 1813 | 2245 | 1998 | 2236 | 0 | 47.5 | 5.2 | 35.1 | 74 | 73 | MR-R-R |
| Sunbred 212, NK | 1975-77 | 1943 | 2427 | 2150 | 2372 | 0 | 46.5 | 5.8 | 35.3 | 71 | 70 | MR-R-S |
| Sunbred 223, NK | 1975-77 | 2064 | 2325 | 2176 | 2468 | 0 | 45.4 | 6.6 | 32.7 | 70 | 33 | R-R-S |
| Sunbred 254, NK | 1976-77 | 2184 | 2025 | 2116 | 2468 | 0 | 44.5 | 4.4 | 31.4 | 72 | 55 | MR-R-R |
| J501, Jacques | 1977 | 2152 | 1982 | 2079 | 2406 | 0 | 45.3 | 4.4 | 34.7 | 70 | 56 | MR-R-MR |
| J701, Jacques | 1977 | 1972 | 1720 | 1864 | 2185 | 0 | 44.5 | 4.9 | 34.8 | 70 | 77 | MR-R-R |
| Big Top +, RBA | 1977 | 2198 | 2342 | 2260 | 2609 | 0 | 45.1 | 5.3 | 33.2 | 70 | 45 | R-R-R |
| LSD 5% | | 260 | 307 | 201 | 349 | | | | | | | |

¹Crookston, Morris. ²Held on a 20/64 round-hole screen. ³Oven-dry. ⁴100 times yield of self-pollinated plants divided by yield of cross-pollinated plants at Rosemount, 1976-77 or one year not adjusted. ⁵Ratings are in order of rust-downy mildew-*Verticillium* wilt and are based on parentage and plot observations, but not on controlled tests with the fungi. R = resistant; S = susceptible; MR = moderately resistant; MS = moderately susceptible; R,S = about half of plants resistant. All varieties are susceptible to stem and head rots caused by *Sclerotinia*.

TALL FESCUE

Tall fescue is a relatively new forage grass in Minnesota. It may be tried in mixtures with other grasses and legumes. It establishes rapidly, withstands trampling, tolerates summer drought, and produces fall season pasture when other grasses become dormant. This bunchgrass is subject to winter injury, but may persist and remain productive in areas with reliable snow cover.

Several European varieties were winterkilled or severely injured

at Rosemount following the 1976/77 winter, when compared with the more winterhardy varieties of U.S. origin. The varieties have been evaluated in pure stands. Therefore, performance may be different when a variety is grown in mixtures with other grasses and legumes. Under these conditions, diseases are less serious, particularly when grazed or harvested frequently.

Table 29. Dry matter yields of tall fescue varieties expressed as percentage of Ky-31 at two locations and average for 1973-77

| Variety | Developer or owner ¹ | Grand Rapids | | Rosemount | | Average | Winter injury ² Rosemount |
|-----------------------|---|--------------------|-----|-----------|-----|---------|---|
| | | No. of trial years | 3 | 2 | 1 | 6 | 1 |
| <i>Ky-31 ton/acre</i> | Ky. Agr. Exp. Sta. & USDA ^b | 4.3 | 5.6 | 2.0 | 4.4 | 6.9 | |
| Aronde | J. Joorden, Vento-Blerick, Netherlands ^a | 100 | 104 | 92 | 100 | 2.8 | |
| Clarine | I.N.R.A., Paris, France ^a | — | — | 99 | 99 | 1.7 | |
| Festal | D.J. van der Have, Netherlands ^a | — | — | 83 | 83 | 3.3 | |
| Kenhy | Ky. Agr. Exp. Sta. & USDA ^a | 100 | 103 | 99 | 101 | 7.0 | |
| Ludelle | I.N.R.A., Paris, France ^a | — | — | 81 | 81 | 3.3 | |
| Ludion | I.N.R.A., Paris, France ^a | — | — | 95 | 95 | 3.5 | |
| Manade | Vilmorin-Andrieux, France ^a | — | — | 91 | 91 | 3.3 | |
| S-170 | Nat'l. Seed Dev. Org., Cambridge, U.K. ^a | — | — | — | 88 | 3.6 | |
| LSD 5% | | 6 | 5 | 12 | | | |

¹ Seed supplies: ^anot available or very limited, ^bavailable from several sources.

² 1 = most damaged, 9 = least damaged, 1977.

TIMOTHY

Timothy is adapted throughout Minnesota for use in hay and pasture mixtures. When timothy is the major component in hay, its stage of maturity affects yield and quality. Harvesting at early bloom stage is preferred to later harvesting. Because timothy varieties differ in maturity, care should be taken in choosing varieties that will fit the management of the crop. Only very early

varieties are adapted to a three-cut system with alfalfa. Varieties of medium and medium-late maturity should not be harvested more than twice during the growing season.

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

Table 30. Dry matter yields of timothy varieties expressed as percentage of Itasca at three locations and average for 1965-77

| Variety | Developer or owner ¹ | Grand Rapids | | Morris | Rosemount | | Average |
|------------------------|---|--------------------|-----|--------|-----------------|-----|---------|
| | | No. of trial years | 6 | 2 | 3 | 4 | 2 |
| Very early | | | | | | | |
| Clair | Kentucky Agr. Exp. Sta. | 97 | 107 | 101 | 106 | 102 | 102 |
| Medium-early | | | | | | | |
| Basho | Agr. Canada, Ottawa ^a | — | 91 | — | 97 ² | 100 | 96 |
| ChAMPLAIN | New York Agr. Exp. Sta. ^a | — | 83 | — | — | 88 | 85 |
| Champ | Agr. Canada, Ottawa ^a | 96 | 93 | — | — | 102 | 97 |
| Timfor | Northrup, King & Co. | — | 93 | — | 102 | 104 | 100 |
| Toro | Institute le Colture Foraggere, Milano, Italy ^a | — | 95 | — | — | 100 | 97 |
| Medium | | | | | | | |
| Bounty | Agr. Canada, Ottawa ^a | — | — | — | — | 95 | 95 |
| Climax | Agr. Canada, Ottawa ^b | 95 | 90 | 100 | 99 | 104 | 97 |
| <i>Itasca ton/acre</i> | Minnesota Agr. Exp. Sta. ^b | 4.0 | 3.8 | 3.7 | 3.2 | 2.7 | 3.6 |
| Milton | Macdonald Coll., Quebec ^a | — | 93 | — | — | 100 | 97 |
| Pronto | Pride Seed Co. | 90 ² | 105 | — | 97 | 103 | 99 |
| Medium-late | | | | | | | |
| Lorain | Ohio Agr. Exp. Sta. & USDA ^a | 90 ² | 92 | 91 | 99 | 105 | 96 |
| Verdant | Wisconsin Agr. Exp. Sta. & USDA | 94 | — | 87 | 98 | — | 92 |
| LSD 5% | | 6 | 8 | 10 | 8 | 6 | |

¹ Seed supplies: ^anot available or very limited, ^bavailable from several sources.

² One year.

DURUM WHEAT

RECOMMENDED VARIETIES

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

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

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

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

OTHER VARIETIES

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

Coulter — Awned, early, medium height and lodging resistance. Resistant to stem rust but moderately resistant to leaf rust. High yield and low test weight. Lower quality than Cando. Licensed in Canada in 1976.

Leeds — Awned, early, medium height and lodging resistance. Moderately resistant to leaf rust, resistant to stem rust and loose smut. Medium yield and very high test weight with large seed.



Agronomist R.E. Heiner between Rugby and Ward durum wheat varieties. Cando, the newest recommended variety, is nearly 25 percent shorter and lodges less than the other recommended varieties.

Satisfactory quality for semolina products. Selected from crosses involving Br. 180 and Wells. Released by North Dakota Agricultural Experiment Station in 1966.

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

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

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

Table 31. Characteristics of durum wheat varieties, 1975-77

| Variety | Heading (June) | Height (inches) | Lodging (score) ¹ | Rust reaction ² | | Weight/ 1000 seeds (grams) ³ | Test weight/ bushel (pounds) | Yield/acre (bushels) | | | |
|---------|-------------------|--------------------|---------------------------------|----------------------------|------|--|---------------------------------------|----------------------|------------------------|---------|----------------------|
| | | | | Leaf | Stem | | | Morris | Crookston ⁴ | Stephen | Average ⁵ |
| Cando | 25 | 29 | 1.6 | MS | R | 36 | 61.1 | 38 | 55 | 79 | 47 |
| Crosby | 24 | 38 | 2.5 | R | R | 39 | 61.3 | 42 | 48 | 65 | 44 |
| Rugby | 25 | 38 | 2.1 | R | R | 38 | 61.5 | 41 | 46 | 68 | 43 |
| Ward | 24 | 37 | 2.2 | MS | R | 39 | 61.1 | 41 | 46 | 68 | 43 |
| Botno | 23 | 37 | 2.2 | MR | R | 40 | 62.1 | 39 | 45 | 67 | 41 |
| Coulter | 24 | 37 | 2.8 | R-MR | R | 37 | 60.4 | 41 | 48 | — | 44 |
| Leeds | 25 | 38 | 3.1 | MR | R | 38 | 63.5 | 38 | 46 | 58 | 41 |
| Mindum | 26 | 45 | 4.4 | R | R | 38 | 60.9 | 27 | 31 | 49 | 29 |
| Rolette | 24 | 35 | 2.6 | MS | R | 41 | 62.6 | 38 | 47 | 65 | 42 |
| LSD 5% | | | | | | | | 5 | 5 | 5 | 3 |

¹ 1 = erect, 9 = flat.

² Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible.

³ 1974-1976.

⁴ 1975 and 1977.

⁵ Stephen not included in average.

HARD RED SPRING WHEAT

RECOMMENDED VARIETIES

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

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

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

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

VARIETIES NOT ADEQUATELY TESTED

Eureka — Awned, medium height and maturity. Fair resistance to lodging. Resistant to stem rust and moderately resistant to leaf rust. Low yield and test weight. Selected from crosses involving Era, Corre camino, Ciano 67, and Sonora 64. Released by South Dakota Agricultural Experiment Station in 1978.

OTHER VARIETIES

Bounty 309 — Awned, medium to early semidwarf with good lodging resistance. Moderately susceptible to both leaf and stem rust. Medium yield and test weight. Medium to poor milling and baking characteristics. Developed by Cargill, Inc., and approved for certification in 1972. Seed sale regulated by U.S. Variety Protection Act.

Butte — Awned, early to midseason. Medium height and lodging resistance. Resistant to stem and leaf rust. Medium yield and very high test weight. Milling characteristics are satisfactory.

Protein content and bake absorption are lower than Chris but better than Era. Selected from crosses involving NC480, Polk and Wisc 261. Released by North Dakota Agricultural Experiment Station in 1977.

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

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

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

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

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

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

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

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



The excellent lodging resistance of Wared, a semidwarf variety, contrasts with the lodged plants of Chris, a medium height variety. Agronomist R.E. Heiner examines Wared.

Table 32. Characteristics of hard red spring wheat varieties, 1975-77

| Variety | Heading (June) | Height (inches) | Lodging (score) ¹ | Rust reaction ² | | Weight/ 1000 seeds (grams) | Test weight/ bushel (pounds) | Wheat protein (percent) ³ | Milking, baking quality | Yield/acre (bushels) | | | | | |
|---------------------|----------------|-----------------|------------------------------|----------------------------|------|----------------------------|------------------------------|--------------------------------------|-------------------------|----------------------|----------|--------|-----------|---------|----------------------|
| | | | | Leaf | Stem | | | | | Waseca ⁴ | St. Paul | Morris | Crookston | Stephen | Average ⁵ |
| Era | 27 | 30 | 2.2 | R-MR | R | 30 | 61.1 | 13.2 | low-med. | 82 | 41 | 41 | 44 | 74 | 50 |
| Kitt | 26 | 31 | 2.2 | R | R | 32 | 58.4 | 14.7 | med.-high | 78 | 37 | 41 | 41 | 73 | 48 |
| Olaf | 25 | 33 | 2.1 | R | R | 34 | 60.4 | 14.6 | medium | 72 | 38 | 38 | 36 | 66 | 45 |
| Wared | 27 | 32 | 2.0 | R | R | 30 | 61.2 | 14.0 | medium | — | 38 | 40 | 40 | 73 | 48 |
| Butte | 23 | 36 | 2.6 | R | R | 33 | 62.0 | 14.2 | med.-high | — | 41 | 38 | 42 | 64 | 46 |
| Chris | 26 | 39 | 3.9 | R-MS | R | 28 | 60.6 | 15.5 | v. high | — | 30 | 34 | 33 | 54 | 38 |
| Ellar | 24 | 37 | 2.6 | MR-MS | R | 34 | 60.4 | 14.9 | medium | 63 | 36 | 34 | 35 | 59 | 41 |
| Eureka ⁶ | 26 | 37 | 4.0 | MR | R | — | 58.9 | — | — | — | 37 | 34 | 34 | — | 35 |
| Glenlea | 26 | 40 | 2.5 | MS | MR | 38 | 59.7 | 14.6 | low-med. | — | 35 | 37 | 34 | 67 | 43 |
| Polk | 25 | 39 | 3.4 | R-MS | R | 35 | 61.9 | 15.0 | v. high | — | 29 | 31 | 36 | 56 | 39 |
| Prodax | 24 | 31 | 2.2 | S | R | 32 | 58.3 | 13.9 | med.-low | 82 | 35 | 40 | 38 | 73 | 47 |
| Profit 75 | 23 | 30 | 2.2 | R-MR | R | 26 | 59.8 | 13.7 | low | 81 | 38 | 40 | 38 | 69 | 46 |
| Protor | 23 | 30 | 1.9 | MS | R | 31 | 61.1 | 14.6 | low | 71 | 42 | 40 | 38 | 71 | 48 |
| Waldron | 24 | 38 | 2.4 | R | R | 34 | 59.6 | 15.2 | high | 66 | 38 | 34 | 36 | 63 | 43 |
| World Seeds | | | | | | | | | | | | | | | |
| 1809 | 20 | 28 | 2.0 | R-MR | R | 30 | 60.0 | 14.4 | medium | 73 | 40 | 33 | 33 | 63 | 42 |
| W.S. 25 | 23 | 31 | 2.3 | R | R | 28 | 59.5 | 13.7 | low | — | 37 | 37 | 41 | 71 | 46 |
| LSD 5% | | | | | | | | | | 7 | 5 | 5 | 3 | 7 | 3 |

¹ 1 = erect, 9 = flat.

² Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible.

³ 14 percent moisture, 1974-76.

⁴ 1976-77.

⁵ Waseca not included in average.

⁶ 1977.

WINTER WHEAT

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

RECOMMENDED VARIETIES

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

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

Winoka — Awned, winterhardy, medium height, maturity, and lodging resistance. Susceptible to leaf rust and moderately resistant to stem rust. Severe leaf necrosis in certain years. Satisfactory milling and baking characteristics. Reselection from Winalta by South Dakota Agricultural Experiment Station in 1968.

VARIETIES NOT ADEQUATELY TESTED

Roughrider — Awned, tall, winterhardy, medium maturity and lodging resistance. Susceptible to leaf rust but resistant to stem rust. Limited data showed high yield and test weight. Released by the North Dakota Agricultural Experiment Station in 1975.

OTHER VARIETIES

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

Centurk — Awned, early, medium height and lodging resistance. Winterhardiness is not satisfactory. Susceptible to leaf rust and moderately resistant to stem rust. Satisfactory quality.

Selected from crosses involving Kenya 58, Newthatch, Hope, Turkey, Cheyenne, and Parker. Released by Nebraska Agricultural Experiment Station in 1971. Seed sale regulated by U.S. Variety Protection Act.

Eklund — Awnless, very tall, medium to late maturity with medium lodging resistance. Susceptible to leaf rust and stem rust. Low yield and test weight. Satisfactory quality. Selected as an individual plant from the variety Minter by Mr. Eklund in northern Minnesota. Seed was available in 1976. Seed sale regulated by U.S. Variety Protection Act.

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

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

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



Roughrider, promising new variety of winter wheat, and agronomist R.L. Thompson.

Table 33. Characteristics of winter wheat varieties, 1975-77

| Variety | Heading (June) | Height (inches) | Winter survival (percent) | Lodging (score) ¹ | Rust reaction ² | | Test weight/bushel (pounds) | Yield/acre (bushels) | | | | |
|------------|----------------|-----------------|---------------------------|------------------------------|----------------------------|------|-----------------------------|----------------------|-----------------|-----------------------|---------------------------|---------|
| | | | | | Leaf | Stem | | Lamberton | Waseca | St. Paul ³ | Grand Rapids ³ | Average |
| Gent | 3 | 39 | 71 | 3.9 | MR | R | 60.4 | 30 | 57 | 41 | 32 | 40 |
| Minter | 7 | 43 | 90 | 5.0 | MS | MS | 60.8 | 32 | 48 | 37 | 40 | 39 |
| Winoka | 5 | 41 | 87 | 4.8 | S | MR | 61.1 | 37 | 54 | 44 | 42 | 44 |
| Bronze | 3 | 37 | 75 | 4.3 | S | R | 59.0 | 29 | 48 | 37 | — | 38 |
| Centurk | 3 | 38 | 69 | 3.9 | S | MR | 59.2 | 31 | 52 | 42 | 48 | 43 |
| Froid | 5 | 43 | 87 | 5.0 | S | MR-S | 59.1 | 31 | 48 | 39 | — | 40 |
| Sundance | 8 | 42 | 92 | 4.3 | S | S | 56.3 | 31 | 49 | 38 | — | 40 |
| Eklund | 7 | 45 | 90 | 5.0 | S | S | 57.5 | 30 ⁴ | 35 ³ | 37 | 28 ⁴ | 32 |
| Roughrider | 4 | 42 | 90 | 4.0 | S | R | 60.8 | 36 ⁴ | 62 ³ | 48 | 47 ⁴ | 48 |
| LSD 5% | | | | | | | | 3 | 4 | 6 | 6 | 2 |

¹ 1 = erect, 9 = flat

² Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible.

³ 1976-77.

⁴ 1977.

WINTER RYE

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

RECOMMENDED VARIETIES

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

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

OTHER VARIETIES

Cougar — Medium yield, winterhardy (only fair hardiness in eastern Minnesota trials), late, medium height. Fair lodging

resistance. Small seed of green and tan color, and medium test weight. Originated by University of Manitoba from an open-pollinated selection in a composite cross of European and Canadian varieties. Licensed in 1967.

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

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

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

Table 34. Yields of winter rye varieties in bushels per acre

| Variety | Rosemount 1973-77 | Grand Rapids 1973-77 | Crookston 1975-77 | Morris 1973-76 | Average (17 trials) |
|---------|----------------------|-------------------------|----------------------|-------------------|------------------------|
| Puma | 55 | 42 | 39 | 44 | 46 |
| Rymin | 62 | 44 | 39 | 42 | 48 |
| Cougar | 53 | 39 | 37 | 44 | 44 |
| LSD 5% | 3 | 2 | 4 | 4 | 2 |

Table 35. Characteristics of winter rye varieties, 4 location average

| Variety | Winterkill (percent) | Heading (May) | Mature (July) | Lodging (score) ¹ | Height (inches) | Weight/100 seeds (grams) | Test weight/bushel (pounds) |
|---------|-------------------------|------------------|------------------|---------------------------------|--------------------|-----------------------------|--------------------------------|
| Puma | 2 | 30 | 20 | 2.9 | 50 | 2.4 | 55.7 |
| Rymin | 7 | 30 | 19 | 2.1 | 48 | 2.7 | 56.0 |
| Cougar | 6 | 31 | 20 | 2.4 | 47 | 2.3 | 55.0 |

¹ 1 = erect, 9 = flat.



Rye varieties released by the Minnesota Agricultural Experiment Station during the last 15 years are stronger-stawed than older varieties. Agronomist, D.L. Rabas stands in a group of tall, erect varieties.

NOTES

PLANTING RATE AND DATE

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

| Crop | Bushel weight* (pounds) | Rate/acre (pounds) | Date |
|--|-------------------------|--------------------|----------------------------|
| Barley | 48 | 72-96 | Early spring |
| Corn | 56 | 10-20 | Late April or early May |
| Flax | 56 | 42-56 | April 15 to May 15 |
| Forage Grasses (perennial) If mixed with legume, sow at time indicated for the legume. | | | |
| Bromegrass in mixtures | 14 | 8-12 | Early spring or summer |
| Orchardgrass in mixtures | 14 | 1.5-3 | Early spring or summer |
| Reed canarygrass alone | 44-48 | 6-8 | Early spring or summer |
| in mixtures | | 4-6 | |
| Tall fescue alone | 23-27 | 10-12 | Early spring or summer |
| in mixtures | | 3-5 | |
| Timothy in mixtures | 45 | 2-6 | Early spring or summer |
| Forage Legumes (perennial) | | | |
| Alfalfa alone | 60 | 10-12 | Early spring to August 10 |
| with grasses | | 5-8 | |
| Alsike clover in mixtures | 60 | 2 | Early spring to August 10 |
| Birdsfoot trefoil | 60 | 5-6 | Early spring |
| Ladino clover in mixtures | 60 | .5-1 | Early spring to August 10 |
| Red clover alone | 60 | 9-11 | Early spring to August 10 |
| with grasses | | 4-8 | |
| Oat | 32 | 64-80 | Early spring |
| Rye | 56 | 56-70 | September |
| Sorghum 18- to 40-inch rows | 50 (sweet), 56 (grain) | 5-10 | May 20 to June 5 for grain |
| 6- to 14-inch rows | | 7-15 | |
| Soybean 6- to 7-inch rows | 60 | 100 (4 seeds/ft.) | May 5-25 |
| 20-inch rows | | 65 (7 seeds/ft.) | |
| 30-inch rows | | 55 (9 seeds/ft.) | |
| 40-inch rows | | 50 (11 seeds/ft.) | |
| Sudangrass 18- to 40-inch rows | 40 | 10-20 | May 20 to June 10 |
| 6- to 14-inch rows | | 25-30 | |
| With 1½ bushels of soybean | | 10 | |
| Wheat Hard Red Spring | 60 | 75-90 | Early spring |
| Durum | | 90 | Early spring |
| Winter | | 75-90 | Aug. 20 to Sept. 20 |
| Other Crops | | | |
| Annual canarygrass | 50 | 40 | Early spring |
| Buckwheat | 48-50 | 40-48 | June 15 to July 15 |
| Field bean Black turtle soup | 60 | 40-45 | May 20 to June 15 |
| Great northern | | 55-100 | |
| Kidney | | 75-100 | |
| Navy | | 40-45 | |
| Pinto | | 60-80 | |
| Small white | | 35-40 | |
| Field pea | 60 | 120-225 | Early spring |
| With 1½ to 2 bushels of oat | | 45-90 | |
| Fababean -- medium size | 60 | 180 | Early spring |
| With 2 bushels of oat | | 60 | |
| Millet | 48-56 | 20-40 | June 15 to July 15 |
| Mustard and oilseed rape | 50-58 | 10 | May 1 to June 15 |
| Rape for forage | 50 | 4-6 | Early spring with oat |
| Sunflower | 24 | 3-8 | May 1-25 |
| Sweet clover | 60 | 10-12 | Early spring |

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