Miscellaneous Report 8 February 1950

Varietal Trials of Farm Crops

H. K. Hayes, E. R. Ausemus,
J. O. Culbertson, J. W. Lambert,
and R. G. Robinson

Agricultural Experiment Station
UNIVERSITY OF MINNESOTA

Varietal Trials of Farm Crops

H. K. Hayes, E. R. Ausemus, J. O. Culbertson,
J. W. Lambert, and R. G. Robinson

A LIST of recommended varieties of farm crops for Minnesota is drawn up annually at a meeting of workers in the Minnesota Agricultural Experiment Station, including subject-matter specialists in Agronomy, Plant Pathology, Agricultural Extension, Soils, and Agricultural Biochemistry at University Farm, and representatives of the branch experiment stations at Waseca, Morris, Crookston, Grand Rapids, and Duluth. To be eligible for recommendation, a variety must have been tested in experimental trials for at least three years. These comparative trials are conducted at the central and branch stations, in southwestern Minnesota in cooperation with several county organizations, and in certain cases on farmers' fields. Reaction to important diseases is tested in specially conducted disease nurseries at the central station in cooperation with the Division of Plant Pathology. Tests for quality are made by the Division of Agricultural Biochemistry or in cooperation with the Northwest Crop Improvement Association. So far as possible, the trials include new varieties of promise developed by other workers.

A list of recommended varieties of farm crops is published annually, as a rule, in Folder 22, Agricultural Extension Service. This folder includes a brief statement of the origin of each variety, a summary of desirable and undesirable characters, and special regions of adaptation in Minnesota.

The present summary includes comparative agronomic data on varieties under trial in field plots, a brief summary of disease reaction taken largely from Folder 22, and a brief history of varieties that were not included in Folder 22, but which were grown in the 1949 trials for barley, flax, oats, rye, spring wheat, winter wheat, and soy beans. For a history and short summary of the characters of varieties included in the recommended list, consult Folder 22.

The individual crop summaries were prepared by the project leaders in Agronomy who are responsible for the varietal improvement studies with various crops. Cooperators from the Division of Plant Pathology include E. C. Stakman, J. J. Christensen, M. B. Moore, and M. F. Kernkamp. Cooperators in the Division of Agricultural Biochemistry include

Accepted for publication January 4, 1950

12,500—2-50

W. F. Geddes, J. B. Thompson, and Calvin Norris. Cooperators at the branch experiment stations include R. E. Hodgson at Waseca, A. W. Edson and R. O. Bridgford at Morris, T. M. McCall and O. C. Soine at Crookston, D. L. Dailey and C. H. Griffith at Grand Rapids, and M. J. Thompson at Duluth. Varietal trials are conducted also in southwestern Minnesota in cooperation with various counties under the direction of R. G. Robinson and the project leaders at University Farm. Certain phases of varietal improvement are in cooperation with crops research workers of the United States Department of Agriculture.

While relatively favorable for farm crops, the 1949 growing season deviated considerably from normal in precipitation and temperature at several locations. At St. Paul precipitation was 3.02 inches below normal during April through June with 1.21 inches more than normal in July. Average mean monthly temperatures from April through July were 3.4 degrees F. above normal. Probably these deviations were similar to those at Rosemount where most of the trials for this region were made in 1949.

At Waseca there was a total deviation of 2.78 inches in precipitation below normal in April and May with an excess of 1.80 inches above normal in June and about normal rainfall in July. Average mean monthly temperatures were 3.1 degrees F. above normal April through July.

At Morris there was a deviation of 4.11 inches less than normal precipitation in April through June with an excess of 6.21 inches in July. The deviation from normal temperature during these four months was much less than at University Farm and Waseca, being only 0.9 degrees F. above normal.

At Crookston there was a deviation below normal of 1.51 inches of precipitation in April but an excess of 5.13 inches in May through July. While April temperatures averaged 2.5 degrees F. above normal, the deviation from normal was very small during May to July, inclusive.

At Grand Rapids there was a total excess precipitation during May through July of 8.65 inches with a mean monthly departure above normal of approximately 2 degrees F. during May and June and about normal temperatures in July.

At Springfield, which is about seven miles from the 1949 trials at Cobden in southwestern Minnesota, the total departure from normal precipitation from April through July was minus 4.05 inches with a deficiency in May of 2.42 inches. Mean monthly temperatures of May through July were 3.2 degrees F. above normal.

As in 1948, height of plants at University Farm and Rosemount was below normal, with less deviation from normal at Waseca. The small grain crops at Morris gave relatively good yields in spite of the deficiency in rainfall during the early part of the season and the excess in July.

Without doubt the great excess of moisture at Crookston greatly affected general performance at that station.

As in 1948, on an average, the crops in most trials were less affected by plant diseases than they often are and comparative performance under the rather abnormal seasonal conditions may not be indicative of what usually may be expected.

In this report, calculated least significant differences at the 5 per cent point are included in the yield summaries for each location. The values given in the row under L.S.D. 5 per cent are in bushels. A difference between two varieties as great as the one given for each location can be expected to occur due to chance alone, on the average, once in 20 trials.

In 1949, trials of small grains and flax were transferred from University Farm to Rosemount. Summaries in the tables for University Farm and Rosemount include data obtained at University Farm prior to 1949 and at Rosemount in 1949.

Field plot trials of soybeans were conducted at both University Farm and Rosemount in 1948 and 1949. The summaries in the soybean tables include data for both of these stations during these two years.

BARLEY

J. W. LAMBERT

Yield Comparisons

Average yields in bushels per acre are given in table 1 for 1947-49. Seed for the trials was treated with New Improved Ceresan.

As an average of two years, 1947-48, at University Farm and one year, 1949, at Rosemount, the feed varieties Mars, Feebar, and Plains, excelled the malting varieties Barbless, Kindred, Montcalm, and Moore, in yield. Plains was particularly outstanding in these trials. During the period 1947-49, the yield differences between varieties were very small at Waseca, although here again Plains was the highest yielder. At Morris, Plains was highest in yield followed by Barbless, Feebar, Mars, and Moore. Both Kindred and O.A.C. 21 gave rela-

Table 1. Yield of Barley in Bushels per Acre in Field Plot Trials at University Farm for 1947-48 and at Rosemount for 1949 and at Waseca, Morris, Crookston, Grand Rapids, and in Southwestern Minnesota for 1947-49

Variety	University Farm and Rosemount	Waseca	Morris	Crookston	Grand Rapids	Southwestern Minnesota
Barbless	51.9	47.3	48.6	39.1	44.0	45.0
Mars	55.4	46.1	47.6	45.5	44.9	41.0
Kindred	50.5	46.2	42.5	48.1	44.7	43.2
Montcalm	50.6	47.7	44.3	42.3	42.1	44.7
Moore	49.2	47.2	46.7	35.0	45.4	44.6
Feebar	57.3	48.7	48.6	45.0	46.3	46.3
Plains	61.9	49.3	51.1	46.6	49.4	47.0
O.A.C. 21	.....	.....	42.3	48.3	.....	.....
Tregal	.....	.....	.....	45.3	52.2	.....
Trebi	.....	.....	.....	.....	53.1	.....
Peatland	.....	.....	.....	.....	45.0	.....
L.S.D. (5 per cent)	5.9	4.5	6.3	5.3	5.2	3.7

tively low yields. These latter two varieties, however, were outstanding in yield at Crookston. Moore was notably low in yield at Crookston and Barbless also gave a low yield. At Grand Rapids, Trebi and Tregal were the highest yielders. Plains also gave a high yield. The rest of the varieties yielded about alike, though Montcalm was slightly lower than the others. In southwestern Minnesota, Plains and Feebar were the highest yielding varieties. Mars was lowest. The other four were similar and were medium in yield.

Other Agronomic Characters

Comparative data on agronomic characters given in table 2 include averages at several locations. Data at Grand Rapids are given because three varieties were included at that station which were not grown at other stations.

As an average of four locations, Plains was the earliest variety heading three days earlier than Mars, Kindred, and Feebar. Montcalm headed three days later, and Barbless and Moore headed four days later than Mars. At Grand Rapids, Plains headed one day earlier than Mars, two days earlier than Kindred and Trebi, three days earlier than Feebar and Tregal, five days earlier than Montcalm, and six days before Barbless, Moore, and Peatland.

Barbless, Montcalm, and Moore were similar in height at the five locations, averaging four or five inches taller than Mars. Feebar and Plans were the shortest varieties, averaging two inches shorter than Mars. At Grand Rapids, Kindred was the tallest variety, followed closely by Barbless, Moore, and Peatland. Trebi was the shortest variety. Feebar, Plains, and Tregal were also relatively short.

In table 2 percentage lodged refers to that percentage of the plot that deviated from upright and degree lodged to the angle that the lodged plants make on an average from an upright position. As an average of five locations, Mars, Feebar, and Plains showed very good strength of straw. Moore showed relatively good straw strength. Barbless and Montcalm were moderately weak-strawed. Kindred had very weak straw. At Grand Rapids, Mars, Moore, and Feebar were very stiff-strawed and Kindred was very weak. The others were intermediate.

Bushel weights averaged higher at the five locations than at Grand Rapids. In general, Mars, Peatland, and Plains ranked high in bushel weight. Feebar was low. The others were intermediate.

Trebi, Plains, and Feebar have large to very large kernels, Mars and Peatland have small kernels, and the other varieties have kernels of intermediate size.

Disease Reaction

All varieties are susceptible to scab, although Peatland is less affected by scab than other varieties.

Barbless is moderately resistant to barley stripe, moderately susceptible to spot blotch, and susceptible to loose smut and stem and leaf rusts.

Mars is resistant to stem rust and moderately resistant to spot blotch, but is susceptible to loose smut and leaf rust.

Kindred is resistant to stem rust and moderately susceptible to spot blotch.

Montcalm is susceptible to stem and leaf rusts, loose smut, mildew, and spot blotch.

Moore is moderately resistant to stem rust and in Wisconsin tests it has shown moderate resistance to spot blotch. It is susceptible to leaf rust, barley stripe, and loose smut. It has also shown unusual susceptiblity to net blotch, particularly at Crookston.

Feebar and Plains are resistant to stem rust, but susceptible to leaf rust, loose smut, and spot blotch. O.A.C. 21, Tregal, and Trebi are susceptible to stem and leaf rusts. Tregal and Trebi are resistant to some races of loose smut.

Table 2. Averages for Date of Heading at Four Locations, University Farm, Rosemount, Waseca, Morris, and Crookston, in 1947-49, for Plant Height in Inches, Per cent and Degree Lodging, and Weight per Bushel in Pounds at Five Locations, University Farm, Rosemount, Waseca, Morris, Crookston, and Southwestern Minnesota, in 1947-49; and for Date of Heading, Plant Height in Inches, Weight per Bushel in Pounds in 1947-49, and Per cent and Degree Lodged in 1948-49 at Grand Rapids

Variety	Average date heading, four locations	Average Five Locations				Grand Rapids				
		Height inches	Lodging		Weight/bu. pounds	Date heading	Height inches	Lodging		Weight/bu. pounds
			per cent	degree				per cent	degree	
Barbless	6-26	34	58	37	45.6	7-2	32	27	23	41.0
Mars	6-22	30	13	20	49.1	6-27	31	8	27	46.1
Kindred	6-22	33	78	36	47.1	6-28	33	47	56	42.5
Montcalm	6-25	35	53	33	46.1	7-1	31	22	47	42.4
Moore	6-26	34	33	36	44.6	7-2	32	8	16	41.6
Feebar	6-22	28	10	14	43.5	6-29	27	4	9	39.1
Plains	6-19	28	20	28	48.0	6-26	28	33	52	44.7
Tregal	.....	.....	.....	.....	.....	6-29	29	21	32	43.6
Trebi	.....	.....	.....	.....	.....	6-28	26	21	23	42.3
Peatland	.....	.....	.....	.....	.....	7-2	32	21	47	46.3

Peatland is resistant to stem rust and moderately resistant to spot blotch and loose smut.

Malting Quality

Barbless and Kindred are readily accepted by the American Malting Trade. On the basis of limited malting and brewing tests in 1947 and 1948 the executive committee of the Malt Research Institute on September 7, 1949, tentatively approved Moore and Montcalm as malting and brewing barleys. Full approval will await more extensive trials of these two varieties. O.A.C. 21, a blue aleurone barley and the standard malting variety in Canada, has found some favor among certain American maltsters and is bought readily by them at malting barley prices. O.A.C. 21 is not, however, generally accepted in the United States as a malting barley.

Mars, Feebar, Tregal, Trebi, and Peatland are all classified as feed barleys.

New Varieties Not So Extensively Tested

Several new strains of barley developed at the Minnesota Experiment Station were tested in field plots in 1948 and 1949.

Vantage is a high-yielding, stiff-strawed feed barley which was developed at Brandon, Manitoba, and has been tested two years in field plots. It is resistant to stem rust, but is susceptible to scab and certain leaf diseases. It matures at about the same time as Barbless.

FLAX

J. O. CULBERTSON

Yield Comparisons

Table 3 gives the average yields in bushels per acre for the four-year period 1946-49 at University Farm and Rosemount, Waseca, Morris, Crookston, Grand Rapids, and southwestern Minnesota.

Koto and Dakota gave the best average yields at University Farm and Rosemount, and Waseca for the last four years; Redwing averaged somewhat less; and Bison and Minerva gave lower yields. Crystal yielded poorly at University Farm and well at Waseca. Dakota has given the highest average yield at Morris with Crystal and Royal yielding slightly less; Koto, Redwing, and Minerva have been intermediate in yield; and Bison has yielded significantly less than all other varieties. At Crookston, the highest average yields were produced by B5128, Bison and Koto; Royal, Dakota, Minerva, and Crystal were intermediate; and Redwing was poorest of all. Dakota yielded significantly more than all other varieties at Grand Rapids; Koto, Redwing,

Table 3. Yield of Flax in Field Plot Trials at University Farm and Rosemount, Waseca, Morris, Crookston, Grand Rapids, and Southwestern Minnesota for 1946-49

Variety	University Farm and Rosemount	Waseca	Morris	Crookston	Grand Rapids	Southwestern Minnesota
Bison	16.2	20.4	17.7	13.4	14.7	15.9
Redwing	17.4	21.8	18.9	8.8	16.9	16.8
Crystal	13.1	21.2	20.8	11.3	16.2	17.7
Koto	18.1	22.9	19.4	13.2	17.5	19.0
Minerva	15.8	20.3	18.6	12.3	16.8	17.0
Dakota	18.4	22.8	21.1	12.5	19.4	19.1
B5128	.....	.....	.....	13.6	.....	.....
Royal	.....	.....	20.3	12.4	.....	.....
L.S.D.	1.5	1.7	1.4	1.8	1.7	1.9

Minerva, and Crystal were intermediate; and Bison gave the poorest yield of all. In southwestern Minnesota the best yielding varieties were Dakota and Koto; Crystal, Minerva, and Redwing were intermediate; while Bison gave the lowest average yield of all.

Other Agronomic and Quality Characters

Data given in table 4 include date ripe, plant height, weight per 1,000 seeds, oil content, and iodine number for eight varieties of flax tested in field plots for the four-year period 1946-49 at five locations. The varieties B5128 and Royal were not grown in all trials, and the data for these varieties have been adjusted so that they are comparable with data for the other varieties.

The average date of ripening of Redwing, the earliest variety, is six days earlier than B5128, the latest variety, and five days earlier than Crystal, Minerva, and Royal. Bison averaged three days later than Redwing, while Koto and Dakota were only one day later.

All the varieties are of essentially the same height, the greatest difference being only two inches. The seed of Redwing is definitely smaller than any of the other varieties. All the other varieties have seeds considered as medium in size, although B5128, Bison, and Crystal have larger seeds than Koto.

Minerva has outstanding oil content, with an average of 2.4 per cent higher than Bison. B5128 and Royal are about equal to Bison in oil content; Crystal and Koto are about 0.5 per cent lower than Bison; and Redwing and Dakota are definitely lower than Bison.

Oil from the seed of Redwing, Crystal, Koto, Minerva, and Dakota has excellent drying quality as indicated by the relatively high iodine number. Bison, B5128, and Royal are lower in oil quality than the other varieties.

Disease Reaction

Bison has generally been considered as the variety most susceptible to rust. However, heavily rusted fields of Koto indicate this variety is fully as susceptible as Bison, at least to some races. More recently, a few fields of Dakota have been heavily rusted showing that it is susceptible to races of rust recently found in the state. Crystal and B5128 are immune to races of rust found in the United States. Minerva and Royal are moderately resistant while Redwing is moderately susceptible.

All the varieties tested have some resistance to wilt. Koto is the most highly resistant, followed by Dakota and Bison; Minerva and Redwing are moderately resistant; while B5128 and Royal are somewhat more susceptible than Redwing. Crystal has been susceptible to late wilt at University Farm, but

Table 4. Average Date Ripe, Height of Plant, Weight per 1,000 Seeds, Oil Content, and Iodine Number for Flax Varieties Grown in Field Plots at Waseca, Morris, Crookston, Grand Rapids, and Southwestern Minnesota in 1946-49

Variety	Date ripe	Height inches	Weight per 1,000 seeds	Oil content	Iodine number
	August		in grams	per cent	
Bison	6	22	6.0	38.0	174
Redwing	3	22	4.5	36.6	184
Crystal	8	23	6.0	37.6	182
Koto	4	22	5.2	37.4	180
Minerva	8	22	5.9	40.4	182
Dakota	4	21	5.8	36.6	183
B5128*	9	21	6.4	38.1	175
Royal*	8	21	5.3	38.1	171

* Not grown at all stations. Data for these varieties have been adjusted so that they are comparable with other varieties.

has not been injured seriously in other trials in Minnesota.

None of the varieties is resistant to pasmo, although there are variations in the degree of susceptibility. Crystal and Minerva are moderately resistant; Redwing and B5128 are susceptible; all the other varieties listed are moderately susceptible.

New Varieties Not Extensively Tested

Two selections from a cross of B5128 x Redson have been grown in field plot yield trials since 1947. These have been given Minnesota numbers 217 and 218.

Both varieties have yielded well for the three-year period; both have high oil content and satisfactory iodine number. They are immune to rust, resistant to wilt, but moderately susceptible to pasmo.

Sheyenne was first included in the field plot yield trials in 1948. As an average of 13 tests for the two-year period 1948-49 it has yielded 90 per cent as much as Dakota.

A cross of C. I. 975 x Sheyenne was included in the field plot trials for the first time in 1949. This variety is known to be superior to Sheyenne in pasmo resistance and has given good yields in rod-row tests in Minnesota. As an average of six tests in 1949, this variety yielded 90 per cent as much as Dakota.

OATS

H. K. HAYES and R. G. ROBINSON

Yield Comparisons

Average yields in bushels per acre are given in table 5 for 1945-49 in trials on experiment station fields and for 1947-49 in trials in southwestern Minnesota. Seed for the trials was treated with New Improved Ceresan. During recent years in Minnesota, stem and crown rust have not caused serious damage to oat varieties. During the last two years no variety of oats has been greatly superior in yield, on the average to the Gopher variety which is known to be susceptible to both stem and crown rust. Weather conditions in both 1948 and 1949 were not particularly favorable for obtaining high yields of oats in most trials.

Conclusions regarding yielding ability of the varieties are not greatly different than in previous years. At University Farm, Rosemount, and Waseca all varieties yielded superior to Gopher and Vicland, on the average. Differences in yield, except for Gopher and Vicland, were very small. At Morris, Gopher yielded slightly more than any other variety while Bonda gave a somewhat lower yield than other varieties. At Crookston, all varieties except Vicland yielded somewhat more than Gopher. Ajax seems superior at this loca-

Table 5. Yield of Oats in Bushels per Acre in Field Plot Trials on Experiment Station Fields for 1945-49 and in Southwestern Minnesota for 1947-49

Variety	University Farm and Rosemount	Waseca	Morris	Crookston	Grand Rapids	Duluth	Southwestern Minnesota
Gopher	78.4	68.2	95.1	68.7	72.4	70.7	73.2
Vicland	75.6	64.7	86.7	62.1	66.1	64.9	62.9
Bonda	85.8	73.8	81.6	70.1	65.7	70.5	69.8
Mindo	86.6	75.6	88.4	72.7	68.3	74.1	58.2
Clinton	84.1	76.5	88.0	73.9	71.3	75.5	70.9
Andrew	88.4	74.0	90.2	74.4	72.1	72.1	67.4
Zephyr	88.3	73.9	93.3	69.1	71.8	76.4	71.0
Ajax	86.5	73.9	92.4	80.3	77.8	76.5	76.1
L.S.D. 5 per cent	5.5	5.8	6.8	7.4	6.9	5.4	5.8

tion. At Grand Rapids, Bonda also yielded the lowest of all varieties while Ajax was the only variety that yielded more than Gopher. Other varieties, however, were about equal to Gopher in yield. At Duluth, all varieties except Vicland and Bonda yielded somewhat superior to Gopher. No variety was greatly superior to others.

Trials have been made in southwestern Minnesota for 1947-49, inclusive. All varieties except Ajax yielded less than Gopher during this period, on an average, although Ajax was not greatly superior to Gopher. There is evidence that the low average yield of Mindo was due largely to the extremely low yield in 1949 when it appeared to be greatly injured by treatment with 2,4-D used as an herbicide.

During the last three years Eaton, selected from a cross of Bond x Iogold by the Michigan station, has been included in the trials at all locations. It has not given superior yields on the average in any location and probably will not be included in further trials. Two selections from Bond x D69 crosses made in Iowa, Acc. 893, C.I. 4285, and Acc. 894, C.I. 4288, were included in trials for 1947-49. These varieties have been superior to Eaton, but not different in yielding ability from other varieties, except in southwestern Minnesota where they excelled in yield. The difference in this location was due to high comparative yields of these two varieties in 1947. In 1948 and 1949 they were not greatly different from other varieties in yield.

Shelby, selected from a cross of Bond x Anthony at the Iowa station, has been included in 1/40 acre trials in 1948 and 1949 and in rod-row trials at four stations in 1945 to 1947, inclusive. Average yields for these trials in comparison with Clinton, Andrew, and Gopher were: Shelby, 77.5 bushels; Clinton, 72.9 bushels; Andrew, 72.8 bushels; and Gopher, 72.0 bushels, with an average L.S.D. at the 5 per cent point of 3.7 bushels. These results indicate that Shelby has high yielding ability. In these 25 comparisons Shelby led in nine comparisons, Andrew in six, Gopher in five, and Clinton in four, with Shelby and Gopher tied for high yield in one comparison.

Other Agronomic Characters

Comparative data on agronomic characters are given in table 6.

Table 6. Averages for Date of Heading at University Farm and Rosemount, Waseca, Morris, and Crookston, 1947-49; Height in Inches and Weight per Bushel in Pounds at the Same Four Stations and in Southwestern Minnesota, 1947-49; Weight of 200 Kernels in Grams and Hull Percentages at Same Five Stations, 1947-48; Percentage and Degree Lodged at Four Stations, 1945-49 and Southwestern Minnesota, 1947-49

Variety	Four Stations	Five Stations					
		1947-49		1947-48		1945-49 and 1947-49*	
	Date heading	Height	Weight per bu.	Weight of 200 kernels	Hull per cent	Per cent lodged	Degree lodged
		inches	*pounds*	*grams*			
Gopher	6-27	35	34.5	4.6	30.3	22	27
Vicland	6-26	32	33.8	4.8	32.8	24	27
Bonda	6-24	37	37.7	6.1	32.0	19	25
Mindo	6-21	32	35.2	5.1	30.4	13	23
Clinton	6-25	34	36.1	4.9	28.3	20	22
Andrew	6-21	35	35.6	5.5	27.2	16	17
Zephyr	6-27	37	34.8	6.5	31.9	23	20
Ajax	6-28	40	34.0	4.9	31.2	38	30

* Average of University Farm and Rosemount, Waseca, Morris, and Crookston 1945-49; and Southwestern Minnesota 1947-49.

Averages for date of heading for 1947-49 at four regions, University Farm and Rosemount, Waseca, Morris, and Crookston, show Mindo and Andrew three to four days earlier in heading than Bonda and Clinton. Gopher and Zephyr headed six days later than Mindo and Andrew and one day earlier than Ajax.

At five regions including southwestern Minnesota, Ajax was the tallest variety. Zephyr and Bonda averaged three inches shorter than Ajax and two inches taller than Andrew and Gopher. Clinton was one inch shorter than Gopher and Mindo three inches shorter.

During the period from 1947-49 all varieties gave excellent weight per measured bushel with Bonda superior in this respect.

Zephyr and Bonda have the greatest kernel weight, while Andrew is somewhat intermediate in grain size.

Hull percentages have been considerably higher in recent years when growing conditions, on the average, have been somewhat variable. Andrew and Clinton excel in having a lower percentage of hull than the other varieties.

Lodging is given on the basis of percentage of the plants that were lodged while degree refers to the average deviation from vertical made by the lodged plants. Higher percentage values in both percentage lodged and degree represent more severe lodging. The data given are an average of 1945 to 1949 at University Farm and Rosemount, Waseca, Morris, and Crookston and 1947-49 in southwestern Minnesota.

Mindo, Andrew, Clinton, and Bonda, in that order, excelled in standing ability. Zephyr is relatively similar to Gopher in standing ability while Ajax was most susceptible to lodging.

Disease Reaction

During the period of trials reported (1945-49, inclusive) stem and crown rust were of no great importance. Infections were so low that no readings were taken in 1948. Gopher and Ajax, which are susceptible to stem rust and crown rust, had considerable infection with crown rust in 1945 and showed considerable infection in 1947. Even in these two years, however, this infection did not cause marked reduction in yield.

Vicland is susceptible to *Helminthosporium victoriae* which may cause reduction in stands, premature ripening, and a lowering of yielding ability.

Bonda, Mindo, Clinton, Zephyr, and Shelby are resistant to a group of races of stem rust, including race eight, and gave a resistant reaction in all trials. Andrew and Ajax are also resistant to a group of races, but susceptible to race eight. They showed this susceptibility in several trials during this period, but were not noticeably reduced in yield in these trials.

All of the varieties except Gopher, Vicland, and Ajax carry the Bond type of high resistance to many physiologic races of crown rust. All are susceptible to certain races of crown rust, including race 45 which in Iowa has increased in prevalence in recent years. Crown rust in recent years has been heavy in southern United States on Bond derivatives which are susceptible to race 45 and some other races. All of the varieties selected from Bond crosses are usually resistant to smuts.

Other Varieties Not So Extensively Tested

In the 1949 report it was stated that Benton, a selection from Bond x D69 tested for a three-year period, had yielded less than the recommended varieties.

Two Canadian varieties, Beaver from a cross of Vanguard x Erban, and Exeter from a cross of Victory x Rusota, previously were tested at four stations in Minnesota. While they have given good yields in rod-row trials they are known to be more susceptible to crown

Table 7. Yield of Bread Wheats and Durums Grown in Field Plot Trials at Six Experiment Stations During Two Periods, 1943-49 and 1947-49, and in Southwestern Minnesota During 1947-49

Variety	Minnesota number	University Farm and Rosemount		Waseca		Morris		Crookston		Southwestern Minnesota	Grand Rapids		Duluth	
		1943-49	1947-49	1943-49	1947-49	1943-49	1947-49	1943-49	1947-49	1947-49	1943-49	1947-49	1943-49	1947-49
Bread wheats														
Thatcher	2303	26.6	21.8	20.2	23.3	29.3	30.7	26.5	24.3	22.3	.....	.....	.....	.....
Rival	2670	28.0	21.0	23.5	26.4	32.7	31.8	28.5	26.6	23.4	20.9	18.7	20.6	21.9
Pilot	2687	29.1	24.2	22.9	26.3	31.1	31.7	26.4	23.9	24.7	.....	.....	.....	.....
Mida	2689	28.6	22.5	22.1	24.3	31.6	31.7	29.2	27.1	24.8	21.5	18.9	18.3	18.5
Cadet	2705	26.2	19.9	21.0	23.1	28.9	30.6	27.1	25.2	.....	.....	.....	.....	.....
Henry	2753	30.3	22.1	25.0	28.3	33.7	34.6	31.0	28.5	27.6	.....	17.4	.....	19.4
Lee	2776	.....	23.6	.....	26.1	.....	33.6	.....	29.8	24.3	.....	18.8	.....	17.4
Hope x Timstein	2789	.....	25.9	.....	28.5	.....	38.3	.....	30.3	26.1	.....	.....	.....	.....
Redman	2777	.....	24.2	.....	.....	.....	33.4	.....	23.6	.....	.....	.....	.....	.....
Durums														
Mindum	470	29.3	20.6	.....	.....	34.0	33.2	30.4	29.0	.....	.....	.....	.....	.....
Carleton	2707	26.6	17.8	.....	.....	32.3	30.5	29.4	25.7	.....	.....	.....	.....	.....
Stewart	2708	27.3	17.5	.....	.....	35.3	33.6	31.4	32.1	.....	.....	.....	.....	.....
L.S.D. (5 per cent)	.....	4.4	4.8	3.8	3.4	3.8	3.3	6.5	7.3	5.2	5.4	5.4	3.7	5.0

rust than the recommended varieties. For that reason it did not seem necessary to test these two varieties more extensively.

A considerable number of other varieties selected from Bond crosses have been tested in rod-row trials at four stations for a two-year period. During this time, on the average, no variety yielded higher than Gopher.

A considerable group of reselected strains of Clinton have been included in these trials. A brief statement of the origin of other varieties included in the trials may be of interest. These are (1) Bonham, C.I. 4676, a mass selection made in Michigan from C.I. 3664, from a cross of Bond x D69; (2) Cherokee, C.I. 3846, also from a cross of Bond x D69, being grown in Kansas and Nebraska; (3) Berry, probably of similar breeding to Cherokee; (4) Nemaha, C.I. 4301, a selection from a cross of Victoria-Richland x Morota-Bond, being grown in Kansas and Nebraska; (5) Colo, C.I. 3972, selected from a cross of Hancock x Morota-Bond; (6) Mohawk, selected in Iowa from a cross of Bond x D67, that has been distributed in New York, and (7) Kent, C.I. 3909, from a cross of Bond x D69 selected in Michigan, that has been under trial at four stations in Minnesota only in 1949. It has been grown previously in rod-row trials at University Farm, St. Paul.

A new variety of Hull-less oats, C.I. 5015, now being increased in South Dakota for distribution, gave good yields in the regular plot trials in 1949. It is a selection from a cross of (Bond-Double-Cross-Bond C.I. 3650) x Nakota.

SPRING WHEAT

E. R. AUSEMUS

Yield Comparisons

Comparative average yield data are given in table 7 for two different periods, 1943-49 and 1947-49 for the six experiment stations, and in 1947-49 for southwestern Minnesota. Seed for the trials was treated with New Improved Ceresan.

The recommended bread wheat varieties, Mida, Rival, and Pilot gave higher yields than Thatcher or Cadet. At Waseca, Rival outyielded the other two recommended varieties and is probably the most desirable variety for southern Minnesota. Rival was the highest yielding also at Morris during both periods, although all three recommended varieties yielded approximately the same during the shorter period. Mida yielded slightly higher at Crookston and in southwestern Minnesota than the other two recommended varieties.

On the average, Henry yielded more than the recommended varieties at Waseca, Morris, Crookston, and southwestern Minnesota. It has not been recommended because of inferior milling and baking qualities.

During the three-year period 1947-49, the two new hybrid wheats, Lee, Hope x Timstein (Minn. No. 2789) have yielded as well as or better than Rival, Pilot, or Mida. Minn. No. 2789 has been Lee has exceeded the recommended varieties at Morris and Crookston. Redman gave good yields at University Farm, Rosemount, and Morris and in southwestern Minnesota, but low yields at Crookston. Mindum and Stewart were the highest yielding durums.

Other Agronomic Characters

Comparative data on agronomic characters are given in table 8.

Averages for 1947-49 in the four regions, University Farm and Rosemount, Waseca, Morris, and Crookston were used in the comparisons. For date of heading, Hope x Timstein (Minn. No. 2789) and Lee were the earliest bread wheats, while Redman, Thatcher, and Mida were two or three days later. The other bread wheats were four to six days later in heading than Minn.

Table 8. Averages for Date of Heading, Plant Height in Inches, and Weight per Bushel for Four Regions, University Farm and Rosemount, Waseca, Morris, and Crookston, in 1947-49

Variety	Date heading	Height inches	Weight per bu. pounds
Bread wheats			
Thatcher	6-26	34	56.8
Rival	6-27	37	57.6
Pilot	6-28	36	56.1
Mida	6-26	37	59.2
Cadet	6-29	37	55.3
Henry	6-27	36	57.3
Lee (2776)	6-24	33	58.4
Hope x Timstein (2789)	6-23	33	59.6
Redman*	6-26	34	55.6
Durums†			
Mindum	7-1	43	60.7
Carleton	7-2	43	60.4
Stewart	7-2	44	60.7

* Not grown at Waseca. Data for this variety have been adjusted so that they are comparable with other varieties.
† Data from University Farm and Rosemount, Morris, and Crookston only.

No. 2789, the earliest variety. Cadet was the latest heading variety. The Hope x Timstein selection (Minn. No. 2789) and Lee were the shortest varieties. Mida, Rival, and Cadet were the tallest varieties. Hope x Timstein (Minn. No. 2789) excelled in weight per bushel being slightly higher than Mida and Lee.

The durum variety, Mindum, was one day earlier than Carleton and Stewart. Stewart was the tallest durum variety while Mindum and Stewart excelled in weight per bushel.

Quality

All the recommended varieties of bread wheats and Redman are acceptable to the trade in milling and baking characters.

One of the newer varieties, Minn. No. 2789 is questionable. Henry has been classified as undesirable in milling and baking quality.

All three durums are accepted by the trade for the making of semolina products.

Disease Reaction

All varieties of the bread wheats and the two durums, Carleton and Stewart, are moderately resistant to stem rust. Two bread wheat varieties, Lee and Hope x Timstein (Minn. No. 2789) are moderately resistant to leaf rust.

Mida and Lee are moderately susceptible to loose smut. The other varieties were moderately resistant. Mida, Rival, Pilot, Lee, Hope x Timstein (Minn. No. 2789), and Redman are moderately resistant to bunt. Carleton and Stewart are moderately susceptible.

All varieties are susceptible to scab, although Rival appears to be somewhat less so than the others. If spring wheat follows corn in the rotation in southern Minnesota, it may be severely injured by scab.

New Varieties Not Extensively Tested

Eleven new hybrid varieties, tested for one or two years at two or more of the stations, are moderately resistant to stem rust. Seven of these are Timstein derivatives and are moderately resistant to leaf rust. Hope x Timstein (Minn. No. 2796) Mida x Cadet (Minn. No. 2799) and Pilot x Mida (Minn. No. 2802) have given good yields and appear satisfactory in milling and baking characters in preliminary trials.

Table 9. Summary of Yield in Bushels per Acre of Winter Wheat Varieties Grown at University Farm, Waseca, and Grand Rapids in 1945-48*

Variety	University Farm 1945-49	Waseca 1945-49	Grand Rapids 1945-49
Minturki	26.0	20.6	30.8
Marmin	27.5	19.8	28.3
Minter	27.4	21.2	35.2
Blackhawk	25.4	20.6	29.3

* Crop failure at University Farm and Waseca in 1948, and at Grand Rapids in 1946.

Rushmore, a selection from a cross of Rival x Thatcher made in South Dakota, yielded equal to Rival and Mida at Waseca, Morris, and in southwestern Minnesota, but low at Crookston. It is acceptable to the trade for quality and was released for distribution by South Dakota in 1949. Five Timstein derivatives which have been tested only at Rosemount and Morris in 1949, were moderately resistant to leaf rust, produced good yields, and appear satisfactory in other characters.

WINTER WHEAT

E. R. AUSEMUS

Yield Comparisons

Table 9 gives comparative average yield data for 1945-49 at University Farm, Waseca, and Grand Rapids. There was a crop failure at University Farm and Waseca in 1948, and at Grand Rapids in 1946 because of winter killing. Seed for the trials was treated with New Improved Ceresan.

Average yields were higher at Grand Rapids than at the other two stations. The new variety Minter, released to approved seed growers in the fall of 1948, yielded higher than Minturki, Marmin, and Blackhawk except at University Farm where it yielded approximately the same as Marmin.

Other Agronomic Characters

Comparative data on agronomic characters are given in table 10.

Averages at the two stations, University Farm and Waseca, in 1945-49, were made for date of heading, plant height in inches, percentage of winter injury, and weight per bushel in pounds. Marmin was the earliest heading variety, Minter and Minturki were a day later, and Blackhawk was the latest. Minter was the shortest variety with Marmin and Minturki two inches taller, and Blackhawk the tallest. Minter, Marmin, and Minturki had the least winter injury and Blackhawk the highest. Minter excelled in weight per bushel although the test weight of all varieties was excellent.

Disease Reaction

Blackhawk was moderately resistant to leaf rust, while the other three varie-

Table 10. Averages for Date of Heading, Height of Plant in Inches, Percentage of Winter Injury, and Weight per Bushel at University Farm and Waseca in 1945-49*

Variety	Date of heading	Height inches	Winter injury per cent	Weight per bushel pounds
Minturki	6-18	39	38	59.8
Marmin	6-17	39	38	59.7
Minter	6-18	37	37	60.1
Blackhawk	6-20	40	44	59.6

* Crop failure at both stations in 1948.

ties were susceptible. Minter was moderately resistant to stem rust while Minturki, Marmin, and Blackhawk were susceptible.

Quality

Minter and Blackhawk were superior to Marmin and Minturki in milling and baking quality. Minter had a whiter crumb color and lower carotinoid pigment content than Minturki.

New Varieties Not Extensively Tested

Eight new hybrid varieties were tested in 1947-49 and three additional ones in 1949. Ten of these are selections from crosses between Hope or H-44 and their derivations with Minturki or Marmin. Each of these new selections has been moderately resistant to stem rust, and in preliminary milling and baking trials have been superior to Minturki or Marmin in quality.

WINTER RYE

H. K. HAYES and R. G. ROBINSON

Three recommended varieties of rye have been grown in yield trials at experiment station fields for many years. Trials were discontinued at University Farm and Waseca in 1947 but they have been continued at Morris, Crookston, Grand Rapids, and Duluth.

Trials have been made on sandy soil for 1947-49, inclusive, on farmers' fields. In addition to the recommended varieties a local variety when available has been included in these trials.

The three recommended varieties are Dakold, a variety with different seed colors selected at the North Dakota Experiment Station; Emerald, relatively uniform in green seed color produced at the Minnesota station by combining 12 selfed plants of Minn. No. 2, that were breeding relatively true for green seed color; and Imperial, developed at the Wisconsin station, by selection for colorless seed.

Comparative average yield data on experiment station fields are given in table 11 for the number of years in which the varieties have been tested.

In these trials on station fields, Imperial was slightly superior, on the average, in yielding ability to Emerald and, in general, both Emerald and Imperial yielded somewhat higher than Dakold.

Trials on sandy soil from 1947 to 1949, inclusive, have included one each in Anoka and Stearns counties in 1947 and two trials in Anoka and one each in Stearns, Sherburne, and Wright counties in both 1948 and 1949. Local varieties were included also in the 1948 and 1949 trials (see table 12).

In these trials in sandy soils, Emerald yielded more than Dakold or Imperial, on the average, each year of trial while Imperial gave an average yield of 1.2 bushels more than Dakold, although it yielded, on the average, somewhat less than Dakold in 1948.

Imperial seems somewhat more susceptible to winter killing than Emerald

Table 11. Yield of Rye in Bushels per Acre in Station Trials

Location	Number of years tested	Average yield			L.S.D. 5 per cent
		Dakold	Emerald	Imperial	
University Farm	11	38.1	37.9	40.5	2.3
Waseca	12	36.1	38.6	39.7	2.2
Morris	12	26.6	27.9	29.7	1.7
Crookston	3	28.6	28.0	29.9	5.5
Grand Rapids	14	34.1	38.6	38.5	2.5
Duluth	11	17.8	21.2	22.2	2.3

Table 12. Yields of Rye in Bushels per Acre in Trials on Sandy Soil, 1947-49

Variety	Averages			Average
	1947 (2 locations)	1948 (5 locations)	1949 (5 locations)	1947-49 (12 locations)
Dakold	15.5	12.5	16.8	14.8
Emerald	19.7	14.0	20.5	17.6
Imperial	17.5	11.9	19.5	16.0
Local Varieties	.....	11.5	17.3	.....
L.S.D. (5 per cent)	3.3	0.9	1.4	0.9

or Dakold. A new variety, S.D. 44-1, was included in the 1949 trials. It matured several days earlier than the other varieties and resembles Dakold in seed color.

SOYBEANS

J. W. LAMBERT

Yield Comparisons

Average yields in bushels per acre for three different locations in southern Minnesota are given in table 13.

Of the varieties tested in two localities for a four-year period, and in Blue Earth for two years, Habaro excelled in yield at all localities followed closely by Wisconsin Manchu 606 and Ottawa Mandarin. Montreal Manchu, tested for the same period at Waseca and in southwestern Minnesota, yielded slightly more at Waseca than Habaro and slightly less in southwestern Minnesota. A somewhat larger group of varieties was grown for the three-year period, 1947-49, at Waseca and in southwestern Minnesota. Blackhawk yielded slightly less than Montreal Manchu at Waseca and slightly more in southwestern Minnesota. At Blue Earth it yielded 2.3 bushels less than Habaro. Earlyana and Richland yielded somewhat less than Blackhawk in all trials. Hawkeye, tested only in 1948-49, yielded lower at Waseca than all varieties except Earlyana and also gave low yields in Blue Earth but excelled in yield in southwestern Minnesota.

Average yield for two regions in Central Minnesota, Rosemount and University Farm, and Morris for three different periods are given in table 14.

The data for University Farm and Rosemount are for three periods, University Farm 1946, 1947, and 1949 and Rosemount 1948-49; University Farm 1947 and 1949 and Rosemount 1948-49;

Table 13. Yield of Soybeans in Field Plot Trials at Waseca and in Southwestern Minnesota for Three Periods, 1946-49, 1947-49, and 1948-49; and at Blue Earth, 1948-49

Variety	Waseca			Southwestern Minnesota			Blue Earth
	1946-49	1947-49	1948-49	1946-49	1947-49	1948-49	1948-49
Flambeau	25.2	24.3	24.2	20.0	19.6	18.8	.....
Ottawa Mandarin	27.4	27.1	25.3	19.7	20.0	19.8	37.1
Habaro	28.2	28.0	26.0	21.7	22.5	21.3	37.1
Wisconsin Manchu 606	27.7	26.3	25.0	21.0	22.2	21.5	36.0
Montreal Manchu	29.4	29.9	28.3	21.3	21.9	19.6	.....
Overlander Manchu	.....	.....	28.9	.....	.....	19.6	.....
Monroe	26.6	26.4	25.2	.....	.....	19.7	31.1
Blackhawk	.....	28.0	25.8	.....	23.3	23.2	34.8
Earlyana	.....	24.5	21.4	.....	22.3	20.8	33.9
Richland	.....	23.8	24.0	.....	22.1	22.3	32.9
Hawkeye	.....	.....	22.4	.....	.....	25.1	31.6
Lincoln	.....	.....	.....	.....	.....	.....	33.3
L.S.D. (5 per cent level)	2.0	2.2	2.7	2.5	3.2	3.4	3.3

Table 14. Yield of Soybeans in Bushels per Acre in Field Plot Trials at University Farm and Rosemount, 1946-49, 1947-49, and 1948-49; and at Morris for the Same Periods

Variety	University Farm and Rosemount			Morris		
	University Farm 1946, 1947, and 1949 Rosemount 1948-49	University Farm 1947 and 1949 Rosemount 1948-49	University Farm 1949 Rosemount 1948-49	1946-49	1947-49	1948-49
Kabott	.....	.....	.....	19.4	20.6	23.3
Flambeau	17.8	19.7	22.7	24.3	24.0	27.3
Ottawa Mandarin	22.1	25.8	26.0	24.2	24.6	27.8
Habaro	19.2	23.4	25.6	21.8	21.6	24.4
Wis. Manchu 606	19.0	23.7	25.2	22.3	20.6	22.2
Montreal Manchu	20.4	24.2	27.0	.....	23.9	26.6
Overlander Manchu	21.2	25.1	28.8	22.9	22.2	24.5
Monroe	18.7	22.8	25.6	.....	.....	21.6
Blackhawk	.....	25.5	27.0	.....	20.9	23.0
Earlyana	.....	20.9	23.2	.....	.....	.....
Richland	.....	21.2	22.2	.....	.....	.....
Capital	.....	.....	31.3	.....	.....	24.7
Hawkeye	.....	.....	19.8	.....	.....	.....
L.S.D. (5 per cent level)	2.1	2.7	2.9	1.8	1.9	2.6

and University Farm 1949 and Rosemount 1948-49. For the longer period, Ottawa Mandarin and Overlander Manchu gave the highest yield while Flambeau yielded the least. Ottawa Mandarin, Blackhawk, and Overlander Manchu excelled in yield for the two-year period at University Farm and Rosemount. For the varieties tested in 1949 at University Farm and in 1948-49 at Rosemount, Capital excelled in yield followed by Overlander Manchu. Montreal Manchu and Blackhawk also gave good yields. Hawkeye, Richland, Flambeau, and Earlyana were low yielders.

Somewhat earlier-maturing varieties are needed at Morris than at University Farm. For the three periods reported in the table, Ottawa Mandarin and Flambeau excelled in yield. For the two periods in which it was tested, Montreal Manchu also yielded well.

Yields in Northern Minnesota are given in table 15.

Differences between varieties were not great at Crookston during either 1946-49 or 1948-49. The general yield levels, however, were higher during the two-year period than during the four-year period. Montreal Manchu

Table 15. Yield of Soybeans in Bushels per Acre in Field Plots at Crookston in 1946-49 and 1948-49, and at Grand Rapids, 1947-48

Variety	Crookston		Grand Rapids
	1946-49	1948-49	1947-48
Minsoy	16.0	18.2	11.1
Goldsoy	15.2	19.5	18.4
Kabott	13.9	18.0	17.8
Flambeau	16.2	18.3	18.4
Ottawa Mandarin	15.3	19.0	12.8
Montreal Manchu	16.7	21.1	15.2
Overlander Manchu	.....	21.6	.....
Capital	.....	18.5	.....
L.S.D. (5 per cent level)	2.4	2.1	3.4

Table 16. Averages for Date Mature, 1948-49, at University Farm and Rosemount, for Lodging Score and Plant Height in Inches, 1948-49, and Oil Content, 1947-48, at the Four Locations: University Farm, Waseca, Rosemount, and Southwestern Minnesota; for Lodging Score and Plant Height in Inches, 1948-49, and Oil Content, 1947-48, at the Three Locations: University Farm, Rosemount, and Morris; and for Plant Height in Inches, 1948-49, and Oil Content, 1947-48, at Crookston

Variety	Date mature 1948-49 University Farm and Rosemount	Lodging score* 1948-49		Plant height 1948-49			Oil content		
		University Farm, Waseca, Rosemount, and S.W. Minnesota	University Farm, Rosemount, and Morris	University Farm, Waseca, Rosemount, and S.W. Minnesota	University Farm, Rosemount, and Morris	Crookston	University Farm 1947 Waseca 1947-48 Rosemount and S.W. Minnesota 1948	University Farm 1947 Rosemount 1948 Morris 1947-48	Crookston 1947-48
				inches	*inches*	*inches*	*per cent*	*per cent*	*per cent*
Minsoy	.....	.....	.....	.....	.....	24	.....	.....	20.8
Goldsoy	.....	.....	.....	.....	.....	25	.....	.....	21.5
Kabott	.....	.....	.....	.....	.....	23	.....	.....	21.8
Flambeau	9-8	2.1	2.2	25	26	26	19.9	19.8	21.6
Ottawa Mandarin	9-12	1.5	1.5	26	27	25	20.7	20.3	21.6
Habaro	9-20	2.1	2.4	29	30	.....	19.4	19.1	.....
Wis. Manchu 606	9-24	2.4	2.9	33	34	.....	20.8	20.4	.....
Montreal Manchu	9-14	2.2	2.9	31	32	28	20.1	19.9	20.8
erlander Manchu	9-16	2.0	2.5	29	31	26	.....	19.3	.....
??	9-18	2.2	2.7	39	41	.....	20.3	.....	.....
k	9-25	1.7	2.1	36	35	.....	20.9	20.6	.....
.....	9-24	2.8	.....	38	.....	.....	20.0	.....	.....
.....	10-2	1.6	.....	34	.....	.....	20.4	.....	.....
.....	9-18	.....	2.9	.....	33	28	.....	.....	.....
e	10-4	2.0	.....	38	.....	.....	.....	.....	.....

Score of 1 = all plants erect; 5 = all plants entirely lodged.

gave the highest yields in 1946-49 followed closely by Flambeau and Minsoy. Montreal Manchu and Overlander Manchu were highest in yield in 1948-49.

Yields were not obtained at Grand Rapids in 1949 due to flooding of the plots early in the growing season. The 1947-48 data show that Goldsoy, Flambeau, and Kabott were the highest yielding varieties during this period. Minsoy was lowest in yield. Ottawa Mandarin also gave a low yield at this station.

The 1948 and 1949 seasons were unusual in that for much of the principal soybean region of the state the date of the first killing frost in the fall fell in mid-October or later. This enabled the later varieties to mature rather normally. In spite of this fact, however, the later varieties such as Richland and Hawkeye gave little if any better yields than the well-adapted earlier varieties such as Ottawa Mandarin and Habaro.

Other Agronomic Characters and Oil Content

Comparative data on agronomic characters and oil content are given in table 16. During 1948-49 complete maturity data were obtained at only the two stations, University Farm and Rosemount. Lodging was scored on a scale of one to five in which one represented all plants erect and five, all plants completely lodged. Only 1947 and 1948 data for oil content are given since the 1949 oil data are not available now.

Flambeau was the earliest-maturing variety in the tests at University Farm and Rosemount, averaging four days earlier than Ottawa Mandarin. Richland and Hawkeye averaged considerably later than any of the other varieties. These two varieties cannot be recseed produca. As a geninadvisable ture later aro, Wisconsin Manchu 606, Blackhawk, and Earlyana.

Ottawa Mandarin excelled in standing ability. Richland and Blackhawk also stood up relatively well. Wisconsin Manchu 606, Montreal Manchu, and Capital showed the greatest tendency to lodge. The others were intermediate in this respect.

Monroe, Earlyana, and Hawkeye were the tallest varieties. Blackhawk, Richland, and Wisconsin Manchu 606 were the next tallest. The very early varieties tended to be rather short-growing. The remainder of the varieties were intermediate in height.

Oil percentages did not vary widely. Blackhawk, however, averaged slightly higher than the others in oil content. Wisconsin Manchu 606 and Ottawa Mandarin were relatively high in oil also. Habaro was clearly the lowest.

Other Varieties Not So Extensively Tested

Bavender Special is a variety which has been promoted to some extent in Minnesota during the last year. It was developed a few years ago by a Mr. Bavender of Whitten, Iowa. It lodges rather badly and is much too late for Minnesota conditions. Korean is a large-seeded, medium- to late-maturing variety that is being grown to a very limited extent in Minnesota. It is an Oriental variety which came to the United States via the Dominion Experiment Station, Ottawa, Canada. It has been tested only one year in Minnesota. No definite conclusions can be drawn at this time regarding its adaptation in Minnesota.

Several selections recently made at the Minnesota Experiment Station from Lincoln x Richland backcrossed to Lincoln have been tested one or two years in field plot trials. A number of them appear satisfactory in maturity as well as in yielding and standing ability, and they are rather outstanding in the oil content of their seeds.