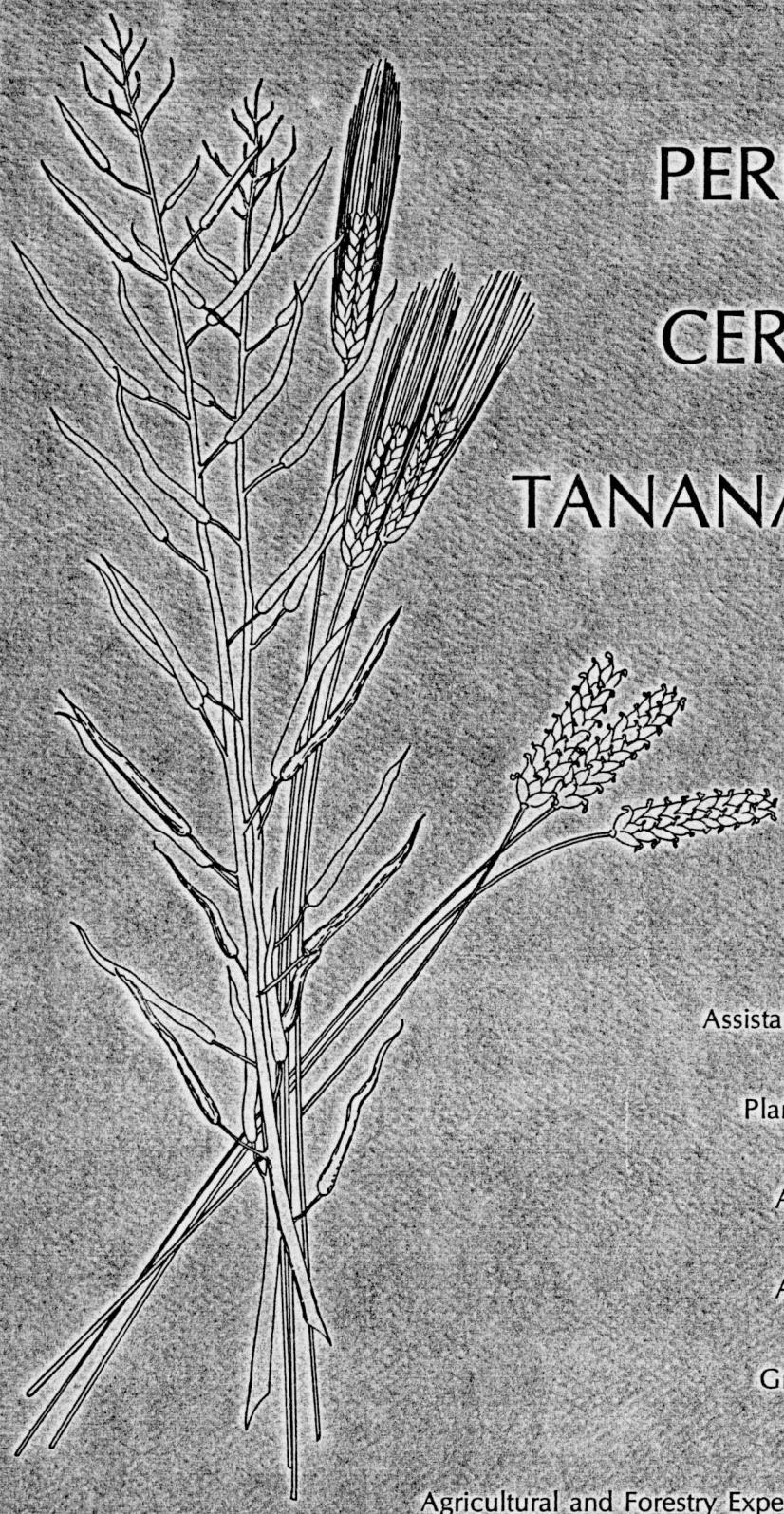

PERFORMANCE of CEREAL CROPS in the TANANA RIVER VALLEY of ALASKA 1984

F.J. Wooding
Professor of Agronomy

J.H. McBeath
Assistant Professor of Plant Pathology

S. Frost
Plant Pathology Research Aide

J.T. Hanscom
Agronomy Research Aide

R.M. Van Veldhuizen
Agronomy Research Aide

A.J. Rippy
Graduate Research Assistant

Agricultural and Forestry Experiment Station
School of Agriculture and Land Resources Management
University of Alaska

Circular 52 James V. Drew, Dean and Director August 1985

Performance of Cereal Crops in the Tanana River Valley of Alaska 1984

F.J. Wooding
Professor of Agronomy

J.H. McBeath
Assistant Professor of Plant Pathology

S. Frost
Plant Pathology Research Aide

J.T. Hanscom
Agronomy Research Aide

R.M. Van Veldhuizen
Agronomy Research Aide

A.J. Rippy
Graduate Research Assistant

School of Agriculture and Land Resources Management
University of Alaska

James V. Drew, Dean and Director

Circular 52

August 1985

Table of Contents

Introduction

This is the sixth publication in this format on grain performance trials in the Tanana River Valley. The first, published 5 years ago, included the results of spring cereal-variety tests conducted at Fairbanks and Delta Junction during the 1978 and 1979 growing seasons. The variety-test results from the 1980, 1981, 1982, and 1983 growing seasons were annual publications. Included in this report are a weather summary, the 1984 variety-test results, and a plant-disease section.

Previous work with grain-variety testing has shown that individual varieties do not perform alike when grown under different conditions. The yield a variety produces can be influenced by crop rotation, soil pH, fertilizer rate, tillage practices, rainfall distribution and amount, seeding rate, planting date, and many other factors. Each variety has its own particular set of growing conditions under which it performs best. For example, in the very same field, a variety that performs well on summer-fallow land may do poorly when planted on stubble land.

There is no such thing as a perfect variety. This is why crop-breeding programs around the world continue to develop new varieties and retire old varieties. For this reason, variety testing is a never-ending process. The primary purpose of variety testing is to find varieties that are most adapted to growing conditions in a particular geographic location. Quite often a distance of only a few miles can make a considerable difference in how a variety performs. This is especially so at northern latitudes where a change in elevation of 200 to 300 feet can have a noticeable effect on climatic conditions.

Some varieties have a wide range of adaptation, while others have a narrow range of adaptation. It is not uncommon for a variety to perform well at Fairbanks and do poorly at Delta Junction or, conversely, to excel in Delta Junction and be poorly adapted at Fairbanks. Because of the highly variable growing conditions in the Tanana Valley, varieties are selected for a wide range of adaptation. For a particular area, this may not always be the highest yielding variety.

Standard varieties, as defined for this report, are varieties that have performed well consistently in tests conducted in at least two Tanana Valley locations over a period of several years. Standard varieties are used as a means for evaluating new entries in the variety trials each year. Comparisons are made with regard to yield, maturity, quality, and growth characteristics.

At the end of each section on barley, oats, and wheat, there is a cumulative list of all varieties tested at Fairbanks and Delta Junction since the program began 14 years ago. This list does not include the names of varieties and experimental lines that were screened in single-row observation plots and were subsequently eliminated for lack of adaptation. Some of the varieties listed were fairly well adapted to the Tanana Valley, but were removed from the testing program to make room for testing of new varieties because they were not quite as good as the standards. Several varieties formerly considered standards, such as Edda, Lidal, and Olli barley; Golden Rain, Rodney, Pendek, and Cayuse oats; and Saunders, Thatcher, and Canthatch wheat, were replaced by improved varieties.

Standard Bushel Weights and Conversions From English to Metric Units

The measure most commonly used by farmers to express yield of grain crops is *bushels per acre*. By law, agricultural commodities of fairly high quality have standard minimum weights per volumetric bushel. One bushel is equal in volume to 2150.42 cubic inches or 8 gallons. Different types of grains have different bushel weights. The standard bushel weights for the grains included in this report are as follows:

Barley = 48 pounds per bushel
Oats = 32 pounds per bushel
Wheat = 60 pounds per bushel

The test-weight apparatus which gives volume weight per bushel is used primarily as an indicator of quality, but the standard weights per bushel are the legal units for purchase and sale. For example, if 100 bushels of barley testing 52 pounds were sold, 4,800 pounds would be delivered, and not 5,200 pounds because the standard bushel weight of barley is 48 pounds.

When a farmer hauls a load of grain to the elevator, it is weighed, and the weight in pounds is divided by the standard bushel weight to determine the number of bushels. Test weights are taken to ascertain quality. A test weight that is lower than the standard can reflect the characteristic of a variety, the presence of foreign material, lack of maturity, disease, excessive nitrogen fertilization, or subjection of the crops to severe drought or high temperatures during critical stages of growth. In the case of barley, a low test weight can also result from incomplete removal of beards during threshing. Test weights of barley can be increased by cleaning and use of a debearding machine. At the elevator, low test weights often result in a reduction in the price paid per bushel.

In the United States, grains are frequently sold in terms of English tons. To express bushels as pounds, multiply the number of bushels by the standard test weight. To express pounds as English tons, divide by 2,000.

On the international markets, grains are often bought and sold on the basis of the metric system of measurement. The most common unit of weight for these transactions is the metric ton. To convert English tons to metric tons, multiply by 0.9072. Similarly, in most countries, yields of crops are expressed as kilograms per hectare. To convert yield from pounds per acre to kilograms per hectare, multiply by 1.121.

The following are some useful relationships between the English and metric systems of measurement:

1 acre	= 43,560 square feet	= 4047 square meters
1 hectare	= 2.471 acre	= 10,000 square meters
1 meter	= 1.094 yard	= 3.232 feet
1 kilogram	= 2.205 pounds	
1 English ton	= 2,000 pounds	= 907 kilograms
1 metric ton	= 1,000 kilograms	= 2,205 pounds.

Part I: Climatic Data and Germplasm Evaluation

Frank J. Wooding
Professor of Agronomy

Jan T. Hanscom
Agronomy Research Aide

Robert M. Van Veldhuizen
Agronomy Research Aide

Ann J. Rippy
Graduate Research Assistant

Tanana Valley Weather Summary

Climatic data for the 1984 growing season for Delta Junction and Fairbanks are summarized in Tables 1 and 2. Temperature and precipitation values given in parentheses represent deviations from long-term averages for each location and are useful in determining the degree of normality of the growing season. The weather station at Delta Junction is located approximately 14 miles from the test site, and the Fairbanks station is located at the University of Alaska Agricultural and Forestry Experiment Station Farm about 400 yards from the test site.

Table 1. Climatic Data for Delta Junction during the 1984 Growing Season.

	May	June	July	August	September
Temp. (°F)					
daily max.	56.9 (−0.2)*	67.2 (+0.1)	66.0 (−3.1)	60.6 (−3.4)	56.0 (+4.2)
daily min.	34.3 (−2.6)	47.3 (+0.2)	49.5 (−0.6)	43.0 (−2.6)	35.5 (+0.2)
daily mean	45.6 (−1.4)	57.3 (+0.2)	57.8 (−1.8)	51.8 (−3.0)	45.8 (+2.2)
Precip. (in.)	1.72 (+0.86)	3.74 (+1.48)	5.98 (+3.30)	2.74 (+0.74)	0.14 (−1.10)

*Values in parentheses represent deviations from a 24-year average.

Table 2. Climatic Data for Fairbanks during the 1984 Growing Season.

	May	June	July	August	September
Temp (°F)					
daily max.	60.7 (+0.5)	74.3 (+2.6)	69.8 (−2.9)	64.1 (−3.2)	59.8 (+4.4)
daily min.	36.6 (+3.0)	48.6 (+4.5)	51.4 (+4.6)	43.9 (+0.9)	33.1 (−0.5)
daily mean	48.7 (+1.8)	61.4 (+3.5)	60.6 (+0.8)	54.0 (−1.2)	46.5 (+1.0)
Precip. (in.)	1.06 (+0.26)	0.85 (−0.63	1.94 (−0.16)	1.30 (−1.14)	0.25 (−1.11)

*Values in parentheses represent deviations from a 34-year average.

The farming area near Delta Junction had a wet growing season in 1984. For the period May through September, the weather station received 14.32 inches of precipitation compared to 9.04 inches for the long-term average. Precipiation for May, June, July, and August was well above normal. September was the only dry month of the season, with just 0.14 inch being recorded. Rainfall early in the season caused grain crops to grow much taller than normal. Later in the growing season, the increased height

resulted in widespread lodging. Lodging was particularly severe in weak-strawed barley varieties which are grown because of their early maturity. The surplus of moisture, throughout the growing season, was also responsible for record high yields of barley and oats.

Daily maximum temperatures at Delta Junction were near normal for may and June, but were well below normal for July and August. The combination of cool-wet conditions experienced during July and August could have been disastrous for grain crops had they continued into September. However, September turned warm and dry, allowing grains to complete the ripening process and providing excellent harvesting conditions.

Total precipitation for the 1984 growing season, May through September, was below normal at the Fairbanks recording station. Fairbanks received 5.40 inches as compared to 8.18 inches for the long-term average. Moisture deficits occurred in 4 out of 5 months, with only May showing a surplus. However, soil moisture supplies were excellent at the start of the growing season, and timely rainfalls in May, June, and July were sufficient to provide good crop yields.

Daily maximum temperatures at Fairbanks for 1984 were warmer than normal for 3 out of the 5 months. July and August were cool months, with daily maximum temperatures averaging 2.9 and 3.2 degrees lower than long-term averages. Maturity dates for most grain crops were about average. The warm-dry weather in September provided good harvest conditions.

Barley Performance Trials

Barley, because of its ability to grow to maturity at cool temperatures and its short growing-season requirement, must be considered the grain most adapted to far-north environments. Several of the earliest-maturing varieties have ripened at Fairbanks when planted as late as the second week of June.

Barley belongs to the genus *Hordeum*, and two species are widely cultivated: *H. vulgare* (6-rowed barley) and *H. distichum* (2-rowed barley). The two species differ primarily in head character (shape of spike and orientation of kernels on the spike). The 6-rowed barleys, because of the availability of several very early varieties, have been the most widely grown in Alaska. The 2-rowed barleys are also highly adapted even though most varieties have a longer growing-season requirement. The earliest 2-rowed variety matures about 9 days later than the earliest 6-rowed variety. Both species have varieties suitable for malting and pearling, but in general most 6-rowed barleys are classified as feed barleys, while most 2-rowed barleys are classified as malting or pearling barleys.

Included in the 1984 trials were three hull-less barleys. Hull-less (also spelled hulless) barleys are frequently referred to as ''naked'' barleys because the hull or husk is removed during threshing. The kernel resembles wheat except that it is noticeably larger. Bushel weights for hull-less barleys are quite similar to those for wheat, varying around 60 pounds. Grain yields are usually lower than those for the hulled types. The head character for these barleys can be either 6-row or 2-row. Hull-less barleys have been grown for use as a human food in the Himalayan region of Asia for centuries.

Barley may also have a winter or spring growth habit. Only those varieties having a spring growth habit are important to Alaska. Barley varieties having a winter growth habit lack hardiness, and therefore have a very low rate of winter survival.

Galt, Otra, Weal, Otal, and *Datal* are the standard barley varieties for the Tanana Valley. These are all 6-rowed barleys and the grain is grown primarily for use as a feed. Yield data for Galt and Weal have been collected at Fairbanks since 1971 and Delta Junction since 1972. Otra was included in the testing program at both locations beginning in 1973. Otal and Datal are more recent additions to the list of standards and have been evaluated for only 6 years. Otal and Datal both mature very early and have been elevated to standard varieties to replace Lidal, an old standard. Otal matures earliest of the standards, with Datal, Otra, Weal, and Galt maturing 1, 3, 7, and 12 days later, respectively. Long-term average yields and ranges in yields for each of the standards are given in Table 3.

Table 3. Long-Term Average and Range of Yields for Barley Standard Varieties Grown at Fairbanks and Delta Junction, 1971-1984 (bu/acre).

Location	Galt	Otra	Otal	Weal	Datal
Fairbanks					
Average yield	94	82	71	79	76
Range of yields	59-127	50-100	49-95	43-125	56-97
Delta Junction					
Average yield	69	79	74	63	71
Range of yields	28-101	33-123	34-97	31-96	33-87
Fairbanks and Delta Junction					
Average yield	81	80	73	71	73
Range of yields	28-127	33-123	34-97	31-125	33-97

Table 4 gives the results of barley variety trials conducted at Fairbanks and Delta Junction during the 1984 growing season. For both tests, fertilizers were applied in the spring with a gravity-flow, broadcast spreader and tilled into the soil during seedbed preparation. Seed was treated with Vitavax and planted at the rate of 72 lbs/acre, in rows 7 inches wide, at a depth of 1.5 inches, with a V-belt seeder equipped with a press wheel. Weeds were controlled with a post-emergence application of Brominal. The following is a brief description of the test sites.

Fairbanks, University Farm, 1984—Fallow Land:

The test was conducted on a Tanana silt loam soil (pH 6.8) which had been cleared and in production for about 56 years. The land had been fallowed the previous summer. Plant nutrients were supplied from urea, 10-20-20, and borax fertilizer materials at a rate of 66 lbs N/acre, 30 lbs P_2O_5/acre, 30 lbs K_2O/acre, and 0.5 lb B/acre. The plots were planted on May 14.

Table 4. Barley Variety Trials Conducted at Delta Junction and Fairbanks During the 1984 Growing Season.

Variety or Experimental Line	Delta Junction University Research Farm		Fairbanks University Farm	
	Yield	Test weight	Yield	Test weight
	(bu/acre)	(lbs/bu)	(bu/acre)	(lbs/bu)
Abee	100	50	93	53
ACA 2561 M268	103	44	100	48
ACA 2562 P693	84	44	93	51
ACA 2563 H349-204	115	47	93	49
ACA 2564 H349-220	109	45	92	48
ACA 2565 H349-347	75	43	94	50
ACA 2566 H349-348	102	49	94	49
Argyle	95	44	67	44
BT 521	99	41	92	42
Datal*	81	43	87	49
Elrose	92	51	59	50
Empress	102	43	96	46
Galt*	93	45	99	46
Hankkija's Eero	98	43	90	46
Hankkija's Pokko	114	44	108	48
Harrington	89	50	77	48
HV #52	76	49	59	46
Jokioinen 1103	110	45	80	45
Jokioinen 1184	95	44	80	47
Jokioinen 1315	111	45	97	48
Leduc	98	44	88	42
Norbert	64	46	67	45
Nova	62	34	80	43
Otal*	77	47	78	49
Otra*	88	46	89	44
Paavo	104	43	106	46
Scout (hull-less)	59	55**	66	60**
Thual (hull-less)	70	57**	77	59**
Tibet (hull-less)	57	57**	69	62**
Weal*	78	35	90	40
Weal Selection	73	42	86	44
Average	89	45**	85	47**

* Standard variety.

** Test weights for hull-less barleys were not included in the average.

Delta Junction, University Reseach Field, 1984—Fallow Land:

The test was conducted on a Nenana silt loam soil (pH 5.8) which had been cleared for 4 years. The land had been fallowed the previous summer. Plant nutrients were supplied from urea, 10-20-20, and borax fertilizer materials at a rate of 90 lbs N/acre, 60 lbs P_2O_5/acre, 60 lbs/K_2O/acre, and 0.5 lb B/acre. The plots were planted on May 8.

Variety Descriptions

Standard Varieties:

DATAL is a new 6-rowed barley release from the U.S. Department of Agriculture breeding program at Palmer, Alaska. Datal was selected from a cross between Edda and an unnamed, early-maturing, 2-rowed selection from Sweden. Edda is a 6-rowed Swedish cultivar which has been grown in Alaska for many years. Datal was previously tested in the Tanana Valley as an experimental line which was designated as 7III-67-22-5. Datal is a very early barley, maturing 2 days earlier than Otra and 1 day later than Otal. Most years, Datal has had good bushel weights at both Fairbanks and Delta Junction. Datal is more subject to yield reductions from early-season drought than is Otal or Otra. In 1984, yields of this variety were near average at both sites. Inquiries on the availability of seed should be directed to the Plant Materials Center[1] or the Alaska Crop Improvement Association.[2]

GALT is a 6-rowed variety developed at the Research Station, Lethbridge, Alberta, through a cooperative project with the Experiment Farm at Swift Current, Saskatchewan. Galt matures 12 days later than Otal, the earliest of the five standards. Galt has consistently produced good yields in variety trials at Fairbanks and Delta Junction since testing began in 1971. Recent data indicate that Galt performs best when planted on fallow land. Galt planted on stubble land is often outyielded by other varieties. Galt has demonstrated excellent resistance to lodging and head shattering. It also appears to have greater tolerance to drought than most other varieties. Galt is recommended where early planting is possible (before May 21 and definitely no later than May 24) and in areas subject to high winds. In 1984, yields of Galt were above average at Fairbanks and Delta Junction. Galt is still a popular variety in Alberta and should be widely available from seed suppliers in that province. Alaska seed producers have encountered some problems of low germination for locally grown Galt.

OTAL is a new 6-rowed barley developed by the U.S. Department of Agriculture breeding program at Palmer, Alaska. Otal was selected from a cross between Otra and an unnamed, early maturing, 2-row selection from Sweden. Otra is a 6-rowed Finnish cultivar which has shown considerable adaptation to interior Alaska. Otal was previously tested in the Tanana Valley as an experimental line which was designated as 71II-67-18-57. Otal is the earliest-maturing standard barley variety. It is highly adapted to growing conditions in the Tanana Valley, particularly the Delta-Clearwater area. For 1981, 1982, and 1983, Otal was among the top three varieties for yield in the Delta Junction trials. However, in 1984, yield of Otal was below average. Test weights for this variety have been consistently good in Tanana Valley Trials. Inquiries on the availability of seed in Alaska should be directed to the Plant Materials Center or the Alaska Crop Improvement Association. Otal has also been released for use by farmers in the Peace River Region of Alberta and British Columbia. Seed should be available from suppliers in these two provinces.

[1] Plant Materials Center, SRB Box 7440, Palmer, Alaska 99645, Phone: 745-4469.
[2] Alaska Crop Improvement Association, P.O. Box 895, Palmer, Alaska 99645, Phone: 745-3257.

OTRA is a 6-rowed variety that originated in Finland and is still widely grown in that country. It is early maturing and has performed satisfactorily even when the planting season is extended into June. Otra has produced good yields under a wide range of growing conditions. Otra has only fair resistance to lodging and head shattering. Field losses from head shattering can be substantial if high winds occur after Otra has ripened fully. Swathing when the grain is at high moisture levels (25-30%) can greatly reduce or eliminate these losses. In 1984, Otra produced near-average yields at Fairbanks and Delta Junction. Inquiries on the availability of seed should be directed to the Alaska Crop Improvement Association or the Plant Materials Center.

WEAL is a 6-rowed variety developed by the U.S. Department of Agriculture at Palmer. It is a hooded variety which was originally developed primarily for use as a component of annual forage mixtures. Weal can be grown in combination with field peas to produce a silage which is equivalent in nutritive value to an oat-pea mixture. Forage dry-matter yields of Weal have been slightly less than the best oat varieties. Weal has performed well as a grain variety for some areas of the Tanana Valley. It matures about 7 days later than Otal and has good resistance to lodging and head shattering. Weal, because it is earlier than Galt and can withstand fairly strong winds, has become a popular variety with some farmers in the Delta Junction area. One problem with Weal is that bushel weights are frequently lower than with most other varieties. This could result in a reduction in price at the elevator. Weal also appears to have less tolerance to drought than other varieties, resulting in considerable fluctuation in yields and bushel weights from year to year and between locations. In 1984, yield of Weal was above average at Fairbanks and below average at Delta Junction. Inquiries on the availability of seed should be directed to the Alaska Crop Improvement Association or the Plant Materials Center.

Test Varieties:

ABEE is a new 2-rowed feed barley developed at Lacombe, Alberta. This variety grows about 6 inches shorter than Galt and has good straw strength. Abee matures at about the same time as Galt. In 1984, Abee produced above-average yields at Fairbanks and Delta Junction. High test weights were recorded at both sites. Evaluation of this variety will continue in 1985.

ACA 2561 M 268 is an experimental 6-rowed barley from the Agricultural University of Norway. It is 6 to 8 inches shorter than Galt, but it has only fair straw strength. It matures at about the same time as Weal. In 1984, this barley produced the third highest yield at Fairbanks and ranked sixth at Delta Junction. This barley had a good test weight at Fairbanks but was 4 pounds below the standard test weight at Delta Junction. Testing of this experimental line will continue in 1985.

ACA 2562 P693 is an experimental 6-rowed barley from the Agricultural University of Norway. It is similar to Galt in height and has some susceptibility to lodging. It matures at about the same time as Galt. During the first year of testing, this barley produced near-average yields at both sites. The test weight at Fairbanks was high, but at Delta Junction it was substandard. Evaluation of this experimental line will continue in 1985.

ACA 2563 H 349-204 is an experimental 6-rowed barley from the Agricultural University of Norway. It is similar to Galt in height and has some susceptibility to lodging. It matures at about the same time as Weal. In 1984, this barley produced the highest yield at Delta Junction and was above average at Fairbanks. At both sites, test weights were within one pound of the standard. Testing of this experimental line will continue in 1985.

ACA 2564 H 349-220 is an experimental 6-rowed barley from the Agricultural University of Norway. It is similar to Galt in height and has good resistance to lodging. It matures 2 to 3 days earlier than Weal. During the first year of testing, this barley produced above-average yields at both sites. It produced a 48-pound test weight at Fairbanks and a 45-pound test weight at Delta Junction. Evaluation of this experimental line will continue in 1985.

ACA 2565 H 349-347 is an experimental 6-rowed barley from the Agricultural University of Norway. It is similar to Galt in height and has some susceptibility to lodging. It matures at the same time as Weal. In 1984, this barley produced yields that were well below average at Delta Junction and above average at Fairbanks. The test weight at Fairbanks was high, but at Delta Junction it was substandard. Evaluation of this experimental line will continue in 1985.

ACA 2566 H 349-348 is an experimental 6-rowed barley from the Agricultural University of Norway. It is 2 to 3 inches shorter than Galt in height and has some susceptibility to lodging. It matures about the same time as Weal. During the first year of testing, this barley produced above-average yields and high test weights at both sites. Testing of this experimental line will continue in 1985.

ARGYLE is a new 6-rowed barley obtained from Winnipeg, Manitoba. It is a very tall variety, attaining a height 4 to 6 inches greater than Galt. It is stiff strawed and has excellent resistance to lodging. Argyle matures about 2 days later than Galt. In 1984, Argyle produced yields that were above average at Delta Junction and below average at Fairbanks. The test weights for this variety were substandard at both locations. Testing of this variety will not be continued in 1985.

BT 521 is a 6-rowed experimental barley received from Lacombe, Alberta. It is about 6 inches shorter than Galt and has excellent resistance to lodging. It matures about 2 days later than Galt. During the first year of testing, BT 521 produced above-average yields at both sites, but the test weights were very low. Evaluation of this experimental line will continue in 1985.

ELROSE is a new 2-rowed barley obtained from Saskatoon, Saskatchewan. It is about 6 inches shorter than Galt in height and has slight susceptibility to lodging. Elrose matures at about the same time as Galt. In the first year of testing, yield of this variety was above average at Delta Junction but was very low at Fairbanks. Elrose produced high test weights at both sites. Testing of this variety will not be continued in 1985.

EMPRESS is a new 6-rowed barley developed at Lacombe, Alberta. This variety attains a height which is 2 inches shorter than Galt and is moderately susceptible to lodging. It matures 2 days earlier than Galt. In 1984, Empress produced above-average yields at both sites but had substandard test weights. Evaluation of this variety will continue in 1985.

HANKKIJA'S EERO is a 6-rowed barley developed by the Hankkija Plant Breeding Institute in Finland. It has been included as an entry in the Tanana Valley testing program for the past 6 years. Its performance has been impressive in most of the tests. At Delta Junction, yield of this variety has ranked first, third, and second in 1979, 1980, and 1981 respectively. In 1983 and 1984, yields were above average at Fairbanks and Delta Junction. It is a semidwarf variety, averaging only 24 inches in height, or about 13 inches shorter than Otra. It matures about 4 days later than Otra. It responds to high fertility without lodging. The low straw yield, because of height, and response to high levels of fertilization may make Hankkija's Eero a key variety for future implementation of minimum-tillage and no-tillage farming practices in the Delta Junction area. Testing of this variety will continue in 1985.

HANKKIJA'S POKKO is a barley introduction received from the Hankkija Plant Breeding Institute in Finland. It is 6-rowed, medium height (34 inches), and matures about 2 to 3 days earlier than Galt. In 1982, Hankkija's Pokko had the second-highest yield at Fairbanks and ranked sixth at Delta Junction. In 1983, this variety produced the third-highest yield at both Fairbanks and Delta Junction. In 1984, Hankkija's Pokko was the highest yielding variety at Fairbanks and ranked second at Delta Junction. Evaluation of this variety will continue in 1985.

HARRINGTON is a new 2-rowed barley obtained from Saskatoon, Saskatchewan. It is 4 to 5 inches shorter than Galt and has slight susceptibility to lodging. It matures 2 to 3 days later than Galt. In 1984, yield of this variety was average at Delta Junction and below average at Fairbanks. Harrington had good test weights at both sites. Testing of this variety will not be continued in 1985.

HV #52 is an experimental 2-rowed barley developed by the Wilbur-Ellis Company of Spokane, Washington. It is 8 inches shorter in height than Galt and has excellent resistance to lodging. It matures at about the same time as Galt. During the first year of testing this barley produced grain yields that were below average at both sites. It produced a good test weight at Delta Junction, but at Fairbanks the test weight was 2 pounds less than the standard. Testing of this experimental line will not continue in 1985.

JOKIOINEN 1103 is a barley introduction from Jokioinen, Finland. It is 6-rowed, tall growing (39 inches), and very early maturing (several days ahead of Otra). In 1982 and 1983, it produced near-average yields at both sites. In 1984, this barley produced the fourth-highest yield at Delta Junction, but was five bushels below average at Fairbanks. Because of its very early maturity, testing of this experimental line will be continued in 1985.

JOKIOINEN 1184 is another barley introduction from Jokioinen, Finland. It is 6-rowed, tall growing (39 inches), and very early maturing (several days ahead of Otra). At Delta Junction, it was the highest-yielding variety in 1982 and 1983, but it was only slightly above average in 1984. However, yields of this barley have been near average at Fairbanks for 3 years of evaluation. Testing of this experimental line will continue in 1985.

JOKIOINEN 1315 is also a barley introduction from Jokioinen, Finland. It is 6-rowed, medium height (35 inches), and very early maturing (several days ahead of Otra). In 1982 and 1983, yields were near average for both locations. In 1984, this barley produced the third-highest yield at Delta Junction and ranked fifth at Fairbanks. Because of its very early maturity, testing of this experimental line will continue in 1985.

LEDUC is a new 6-rowed barley obtained from Regina, Saskatchewan. It is 2 to 3 inches shorter in height than Galt and has some susceptibility to lodging. Leduc matures about 4 days later than Galt. In 1984, this variety produced above-average yields at both sites, but test weights were low. Testing of Leduc will not be continued in 1985.

NORBERT is a new 2-rowed barley obtained from Regina, Saskatchewan. It is 5 inches shorter than Galt and demonstrates good resistance to lodging. Norbert matures 2 to 3 days later than Galt. During the first year of testing, grain yields and test weights for Norbert were low at both sites. Testing of this variety will not be continued in 1985.

NOVA is a 6-rowed barley developed by the Wilbur-Ellis Company of Spokane, Washington. It is a very short (semidwarf) variety and has excellent resistance to lodging. It matures 10 days later

than Galt. In 1984, this variety produced yields and test weights that were low at both sites. Testing of Nova will not be continued in 1985.

PAAVO is a 6-rowed variety from Finland that has been evaluated in the Tanana Valley since 1978. Paavo far outyielded all other varieties at Delta Junction in 1978 and produced respectable yields in 1979, 1980, 1981, and 1982. In 1983, Paavo produced the highest yield at Fairbanks, but was 2 bushels below average at Delta Junction. In 1984, Paavo produced the second-highest yield at Fairbanks and ranked sixth at Delta Junction. It is a fairly early variety, maturing about 2 days later than Otra, Paavo appears to be a slight improvement over Otra for resistance to lodging and head shattering. At this time, seed of Paavo is not available to farmers.

SCOUT (HULL-LESS) is a 2-rowed naked barley developed by the Crop Development Centre at the University of Saskatchewan. Of the three hull-less varieties tested in 1984, Scout was the latest maturing (about 2 days later than Galt). Scout had good straw strength and was relatively free of lodging. At Delta Junction, its yield was greater than Tibet but less than Thual. At Fairbanks, Scout was outperformed by Thual, and the Tibetan line. Testing of this variety will not be continued in 1985.

THUAL (HULL-LESS) is a naked barley developed by the U.S. Department of Agriculture breeding program at Palmer, Alaska. Thual was the earliest maturing of the three hull-less varieties tested in 1984 (about 4 days earlier than Galt). In 1984, Thual was the highest-yielding hull-less barley at both locations. Seed for Thual is available only in Alaska. Inquiries for seed should be directed the Alaska Crop Improvement Association and the Plant Materials Center. Testing of Thual will continue in 1985.

TIBET (HULL-LESS) is a 2-rowed naked barley that was introduced to Alaska from Tibet in 1945. Its growing season requirement is similar to Galt. It is a weak-strawed barley that frequently lodges, particularly at high rates of fertilization. At Delta Junction, in 1984, it was the lowest yielding of the three hull-less barleys. At Fairbanks, its yield was greater than Scout but less than Thual. Testing of this experimental line will not be continued in 1985.

WEAL SELECTION is a hooded 2-rowed experimental barley. It was selected from Weal, which is a 6-rowed hooded variety. It is similar to Weal in height but has greater resistance to lodging. Weal Selection matures about 3 days later than Weal. In 1984, this experimental barley produced grain yields that were 4 to 5 bu/acre less than Weal. However test weights for Weal Selection were noticeably higher than for Weal. Testing of this experimental line will not continue in 1985.

Table 5 provides a cumulative list of all the barley varieties and experimental lines tested at Fairbanks and Delta Junction during the 14-year period from 1971-1984. It also provides the number of years of testing for each variety at these locations.

Table 5. Barley Varieties Tested at Fairbanks and Delta Junction, 1971-1984.

Variety or Experimental Line	Years of testing	
	Fairbanks	Delta Junction
Abee	1	1
ACA 2561 M 268	1	1
ACA 2562 P 693	1	1
ACA 2563 H 349-204	1	1
ACA 2564 H 349-220	1	1
ACA 2565 H 349-347	1	1
ACA 2566 H 349-348	1	1
Advance	1	1
Amy	1	1
Argyl	1	1
Balder	3	2
Beacon	1	1
Bedford	1	1
Belle	1	1
Betzes	6	5
Bode	1	1
Bonanza	3	3
Bonus	2	3
Brock	2	0
Br 6505-5	2	0
Br 6505-21	2	0
Br 6505-31-1	2	0
BT 334 (Johnston)	2	2
BT 521	1	1
Carlsberg II	1	1
Cathy	1	1
Centennial	1	2
Conquest	2	0
Cree	1	1
Datal	6	6
Diamond	1	1
Dickson	1	0
Dolores	1	1
Early Carlsberg II	1	1
Early Freja	1	1
Early Hannchen	1	1
Edda	8	7
Elrose	1	1
Empress	1	1
Erbet	1	1
Ershabet	2	2
Etu	1	1
Exp HV No.9	1	1
Exp HV No. 14	1	1
Fairfield	3	4
Fergus	2	0
Firlbecks III	2	1
Freja	1	1
Frontier	1	0
Galt	14	13
Gateway 63	5	5
Hankkija's 72802	2	2
Hankkija 673	1	2
Jankkija's Aappo	1	1
Hankkija's Eero	6	7
Hankkija's Pokko	3	3
Hannchen	1	1
Harrington	1	1
Herta	1	0
Hiland	1	0
HV #52	1	1
Hyproly	1	0
Hyproly Normal	1	0
Jokioinen 1103	3	3
Jokioinen 1184	3	3
Jokioinen 1315	3	3
Jubilee	4	4
Karl	1	1
Klondike	1	2
Larker	1	1
Lidal	11	10
Leduc	1	1
Lot EX1-N	1	1
Lud	2	2
Mari	2	2
Massey	1	1
Melvin	4	5
Mingo	1	1
Moravian III	1	1
Norbert	1	1
Nova	1	1
NRGB 79-2	1	1
Olli	7	6
Onda	1	1
Otis	2	0
Otal	6	6
Otra	10	12
Paavo	6	7
Palliser	4	2
Paragon	2	0
Parkland	2	0
Piroline	3	2
Poco	1	1
Polaris	4	4
Prilar	1	0
Primus II	2	1
Rovaniemi Sel. 70-B (Finnaska)	6	5
Scout Hull-less	2	2
Shabet	5	6
Stanka	3	1
Steptoe	3	3
Strom	1	1
Summit	2	3
Thual Hull-less	2	2
Tibet Hull-less	5	3
Trebi	1	0
Triumph	3	3
Trophy	1	0
Unitan	1	0
Vale 70	1	1
Weal	14	13
Weal Selection	1	1
Windsor	2	3
62 II-62-2-378-411	3	3
66 II-62-1-209-204	1	1
66 II-62-2-174-191	3	3
66 II-62-3-9-9	2	2
66 II-62-3-12-12	1	1
67-38	1	1
67-488-999	3	3
67-942-241	2	2
68-3	1	1
70-1591-14-11	1	0
71-584-58	1	0
71-991-63	1	0
71 II-67-18-1	1	0
71 II-67-19-91	1	0
71 II-67-21-111	1	0
71 II-67-22-6	1	0
71 II-67-22-18	1	0
71 II-67-22-125	1	0
71 II-67-22-149	1	0
74 Ab 4302	1	1

Oat Performance Trials

Common oats (*Avena sativa*) must be ranked the second most-adapted grain crop for the Tanana Valley. Although most oat varieties generally have a longer growing-season requirement than barley, they will grow to maturity at cool temperatures. The earliest-maturing oat varieties frequently require 7 to 10 days longer to reach maturity than do the earliest-maturing barley varieties. Oats are more tolerant to acid soils than barley or wheat. High oat yields can still be produced when soil pH values range between 5.0 and 5.5.

Oats have traditionally served as a dual-purpose crop for Alaska. They can be harvested for forage at an immature growth stage or harvested for grain at maturity. If oats are harvested for grain, the remaining straw can provide a significant secondary crop. Oats that are to be grown for grain should be planted fairly early, preferably before May 24. When oats are grown for hay or as a component of forage mixtures, planting date is less critical. Oats planted between June 1 and June 15 often grow taller and produce more forage than earlier plantings.

Nip, Athabasca, Cascade, and *Toral* are considered the standard varieties for Tanana Valley. Yield data for Nip and Toral have been collected at Fairbanks since 1971 and at Delta Junction since 1972. Athabasca and Cascade are newcomers to the list of standards. Athabasca has been evaluated at Delta Junction for 6 years and at Fairbanks for 5 years. Cascade has been evaluated at both locations for the past 4 years. Athabasca is a very early-maturing yellow oat which replaces Pendek as a standard variety. Cascade is a medium-maturing, high-yielding, yellow oat which replaces Rodney as a standard variety. Nip and Athabasca mature at about the same time and are the earliest of the oat standards. Toral and Cascade mature 5 and 10 days later, respectively, than Nip and Athabasca. Long-term average yields and ranges in yields for each of the standards are given in Table 6.

Table 6. Long-Term Average and Range in Yields for Oat Standard Varieties Grown at Fairbanks and Delta Junction, 1971-1984.

Location	Nip	Athabasca	Cascade	Toral
	(bu/acre)	(bu/acre)	(bu/acre)	(bu/acre)
Fairbanks				
Average yield	125	129	150	137
Range of yields	52-159	113-149	114-172	67-204
Delta Junction				
Average yield	105	135	142	116
Range of yields	45-160	58-172	49-186	52-179
Fairbanks and Delta Junction				
Average yield	115	132	146	127
Range of yields	45-160	58-172	49-186	52-204

Table 7 gives the results of oat variety trials conducted at Fairbanks and Delta Junction during the 1984 growing season. For both tests, fertilizers were applied in the spring with a gravity-flow, broadcast spreader and tilled into the soil during seedbed preparation. Seed was planted at the rate of 100 lbs/acre, in rows 7 inches wide, at a depth of 1.5 inches, with a V-belt seeder equipped with a press wheel. Weeds were controlled with a postemergence application of Brominal. Following the table is a brief description of the test sites.

Table 7. Oat Variety Trials Conducted at Delta Junction and Fairbanks During the 1984 Growing Season.

Variety or Experimental Line	Delta Junction University Research Farm		Fairbanks University Farm	
	Yield	Test weight	Yield	Test weight
	(bu/acre)	(lbs/bu)	(bu/acre)	(lbs/bu)
ACA 2575-9063 Voll/Selma	138	36	113	32
Athabasca*	172	39	127	36
Calibre	111	37	176	42
Cascade*	186	38	150	38
Dumont	127	36	164	40
Fidler	149	34	143	35
Larry	124	36	122	34
Nip*	160	37	124	35
OAC Woodstock	132	37	148	38
Ogle	128	33	107	33
Pol	148	35	115	30
Toral*	127	40	147	38
Average	142	37	136	36

* Standard variety

Fairbanks, University Farm, 1984.—Fallow Land:

The test was conducted on a Tanana silt loam soil (pH 6.8) which had been cleared and in production for about 56 years. The land had been summer-fallowed the previous year. Plant nutrients were supplied from urea, 10-20-20, and borax fertilizer materials at rates of 66 lbs N/acre, 30 lbs $P_2 0_5$/acre, 30 lbs $K_2 0$/acre, and 0.5 lb B/acre. The plots were planted on May 15.

Delta Junction, University Research Field, 1984—Fallow Land:

The test was conducted on a Nenana silt loam soil (pH 5.8) which had been cleared for 5 years. The land had been summer-fallowed the previous year. Plant nutrients were supplied from urea, 10-20-20, and borax fertilizer materials at a rate of 90 lbs N/acre, 60 lbs $P_2 0_5$/acre, 60 lbs $K_2 0$/ acre, and 0.5 lb B/acre. The plots were planted on May 8.

Variety Descriptions

Standard Varieties:

ATHABASCA is a very early-maturing Canadian variety that has been included as an entry in the Tanana Valley trials since 1979. It is the first yellow oat variety to mature as early as Nip and to produce yields which are equal to or better than Nip. At Delta Junction, Athabasca has outperformed Nip for the past 4 years. Its performance at Fairbanks has been inconsistent, although it tied with Nip as the second highest-yielding variety in 1983 and outperformed Nip in 1984. Athabasca is several inches shorter than Nip and has greater resistance to lodging and shattering. *Athabasca should be considered as a highly suitable grain-oat for Delta Junction.* Because of its shorter height, forage yields can be expected to be less than most other oat varieties. Athabasca should be widely available from seed suppliers in the Peace River region of Alberta.

CASCADE is a fairly new, high-yielding oat variety developed at the Canada Agriculture Research Station, Lacombe, Alberta. This oat has been an entry in the Tanana Valley testing program for the past 4 years. At Delta Junction, yield of Cascade ranked first in 1981 second in 1982, third in 1983, and first in 1984. At Fairbanks, yield of Cascade ranked fourth in 1981, third in 1982, first in 1983, and third in 1984. Cascade is similar to Rodney in height and maturity. Since Cascade is of borderline maturity for parts of the Tanana Valley, use of this variety for grain production involves a greater degree of risk than for earlier-maturing varieties. Early planting greatly reduces this risk. Cascade is suitable for grain and forage production. Seed for this variety should be widely available from western Canadian seed suppliers.

NIP is a blackhulled oat of Swedish origin that has been grown in Alaska since the late 1950s. Nip is probably the best all-purpose oat variety for Alaska. It performs well under a wide range of growing conditions. It is very early maturing and has fairly good resistance to lodging and grain shattering. It produces a fairly tall growth and can be grown for forage. Nip has been popular among some farmers because it can be planted almost a week later than most other varieties and still reach maturity. It appears to be more tolerant than other varieties to late-summer and early-fall frosts, particularly with regard to seed germination. A major problem with growing this oat is that volunteers appear in other grain crops following Nip in the crop rotation. Seed for this variety is available only in Alaska and, in recent years, local supplies have been scarce. Inquiries on the availability of seed should be directed to the Alaska Crop Improvement Association.

TORAL was developed by the U.S. Department of Agriculture at Palmer, Alaska. It has proved to be an outstanding variety in the Tanana Valley. Toral matures about 5 days later than Nip but usually produces higher grain and forage yields. Kernels of Toral have a higher test weight than Nip. It is very resistant to lodging, but slight grain shattering may occur as a result of strong winds or persistent rainfall. Toral, like Nip, is a dual-purpose variety that is suitable for both grain and forage production. In 1984, grain yields of Toral were lower than normal at both test sites. Seed for this variety is available only in Alaska. Seed inquiries should be directed to the Alaska Crop Improvement Association.

Test Varieties:

ACA 2575-9063 VOLL/SELMA is a very early-maturing experimental oat from Norway. This oat matures at about the same time as Pol, which has been the earliest variety in the testing program. It is stiff-strawed and fairly short, attaining a height of about 10 inches less than Athabasca. In 1984, the grain yield for this oat was near average at Delta Junction and well below average at Fairbanks. However, because of its short growing-season requirement, testing of this variety will continue in 1985.

CALIBRE is a new oat variety released by the University of Saskatchewan. It was tested in the Tanana Valley for the first time in 1984. It is a fairly tall-growing oat, reaching heights similar to Nip and Toral. Calibre has demonstrated resistance to lodging. It is later maturing, requiring a growing season 7 to 10 days longer than Nip or Athabasca. In 1984, Calibre produced the highest yield at Fairbanks and the lowest yield at Delta Junction. Testing of this variety will continue in 1985.

DUMONT is a relatively new oat variety developed at the Agriculture Canada Research Station, Winnipeg, Manitoba. It has been tested in the Tanana Valley for the past 2 years. Dumont is a stiff-strawed variety of medium height (2 to 3 inches shorter than Toral). It matures about the same time as Toral or about 5 days earlier than Cascade. In 1983, Dumont was the highest-yielding variety at

Delta Junction and ranked sixth at Fairbanks. in 1984, Dumont ranked second at Fairbanks but produced a below-average yield at Delta Junction. Testing of this variety will continue in 1985.

FIDLER is a Canadian oat variety obtained from the research station at Regina, Saskatchewan. It was tested in the Tanana Valley for the first time in 1984. Fidler is medium height and has good resistance to lodging. It is very late maturing and requires a growing season that is 10-12 days longer than that needed by Nip or Athabasca. During the first year of testing it produced yields which were slightly above average at both sites. Testing of this variety will continue in 1985.

LARRY is a new oat release from the University of Illinois. It is about 10 inches shorter in height than Nip or Cascade and is strictly a grain oat. Larry is a stiff-strawed variety that matures 2 to 3 days earlier than Cascade. In 1984, yields of this variety were well below average at both sites. Testing of this variety will not be continued.

OAC WOODSTOCK is a new oat variety developed by the University of Guelph for use in Eastern Canada. In 1984, it was the tallest-growing oat variety in the Tanana Valley testing program. It was also the latest-maturing variety. Grain yield of OAC Woodstock ranked fourth at Fairbanks but was below average at Delta Junction. Because this variety has demonstrated potential for use as a forage oat, testing will be continued in 1985.

OGLE is a new oat release from the University of Illinois. This variety is very similar to Larry with regard to height, resistance to lodging, and maturity. In 1984, Ogle produced yields which were well below average. Test weights for Ogle were 1 to 3 pounds lower than those of Larry. There will be no further testing of this variety.

POL is a Swedish variety which was introduced to Alaska by a Delta Junction farmer. It is a very early yellow oat, maturing several days ahead of Nip and Athabasca. Pol has a fairly short height, averaging 32 inches. In 3 years of testing, Pol has ranked low for both yield and bushel weight. In 1984, Pol produced the fifth-highest yield at Delta Junction but was well below average at Fairbanks. Because early maturity is so important for Alaska, testing of Pol will continue in 1985. This variety may be useful in areas that have been considered climatically marginal for growing oats.

Table 8 provides a cumulative list of all the oat varieties and experimental lines tested at Fairbanks and Delta Junction during the 13-year period from 1971-1984. It also gives the number of years of testing for each variety at these locations.

Table 8. Oat Varieties Tested at Fairbanks and Delta Junction, 1971-1984.

Variety or Experimental Line	Years of testing	
	Fairbanks	Delta Junction
ACA 2575-9063 Voll/Selma	1	1
Astro	1	1
Athabasca	5	6
Calibre	1	1
Cascade	4	4
Cavell	6	5
Cayuse	6	5
Ceal	6	5
Cherokee	1	0
Chief	1	1
Cody II	1	0
Dumont	2	2
Eagle	3	3
Fidler	1	1
Foothill	2	3
Frazer	5	5
Garry	2	1
Gemini	0	1
Glen	5	4
Golden Rain	3	2
Grizzly	4	4
Harmon	6	5
Hinoat	0	1
Hudson	4	3
Kelsey	4	3
Larry	1	1
Laurent	2	2
Markton	1	0
Nip	14	13
OAC Woodstock	1	1
Ogle	1	1
Orbit	2	2
Pendek	12	12
Pol	3	3
Puhti	1	1
Random	6	5
Rapida	1	0
Rodney	13	12
Rovaniemi Sel. (Orion)	2	2
Russell	2	1
Sioux	4	3
Spear	1	1
Terra	1	2
Toral	14	13
Valko	1	1
Vicland	1	0
Victory	5	5
Vouti	1	1
61 II-55-21-25-8	1	1
61 II-55-21-58-14	1	1
61 II-55-21-15-5	6	5
65 II-58-10-4-3	1	1
65 X-58-26-3-2	1	1
65 X-58-33-2-2	1	1

Spring Wheat Performance Trials

Wheat belongs to the genus *Triticum* and two species are widely cultivated: *T. aesitivum* subspecies *vulgare* (bread wheat) and *T. durum* (macaroni wheat). The bread wheats are subdivided into categories based on growth habit: hard red spring wheat and hard red winter wheat. Most macaroni wheats have a spring growth habit. To date, hard red spring wheats have shown the greatest adaptation to Alaska. Hard red winter wheats frequently have poor survival, which results in greatly reduced yields. Macaroni wheats usually yield less than hard red spring wheats in Alaska and require a longer growing season.

Existing varieties of hard red spring wheats have a narrower range of adaptation than barley or oats. Wheat is more sensitive to cool temperatures, particularly during the maturation stages of growth. If weather conditions during the 30-day period following pollination (usually mid-July to mid-August) are warm and dry, wheat matures about 10 days later than barley. If weather conditions are cool and wet during this period, an additional 10 to 15 days may be required for ripening. For wheat, early maturity far outweighs yield and other growth factors when evaluating new varieties.

For successful wheat production, grain-drying facilities are necessary, and early planting is mandatory. Late plantings may fail to mature or may result in low test weights. Wheat should always be the first crop planted and seeding should begin as soon as the soil can be tilled in late April or early May. To have a high assurance of maturity and good quality, wheat should be planted no later than mid-May.

Gasser, Park, Chena, Ingal, and *Nogal* are the standard wheat varieties for the Tanana Valley. These are not the highest-yielding varieties tested, but they have consistently matured in variety tests over a period of 2 years at two locations. Yield data for Gasser and Park have been collected at Fairbanks since 1971 and at Delta Junction since 1972. Chena was included at both locations, beginning in 1973. Ingal and Nogal were added to the list of standards in 1982. Ingal has been evaluated for 8 years and Nogal has been tested for only 4 years. Long-term average yields and ranges in yields for each of the standards are given in Table 9.

Table 9. Long-Term Average and Range in Yields for Wheat Standard Varieties Grown at Fairbanks and Delta Junction, 1971-1984.

Location	Gasser	Park	Chena	Ingal	Nogal
	(bu/acre)	(bu/acre)	(bu/acre)	(bu/acre)	(bu/acre)
Fairbanks					
Average yield	54	59	72	55	60
Range of yields	33-75	25-76	46-87	18-74	48-69
Delta Junction					
Average yield	38	33	45	39	43
Range of yields	12-69	9-57	14-80	6-64	5-73
Fairbanks and Delta Junction					
Average yield	46	45	58	47	52
Range of yields	12-75	9-76	11-87	6-74	5-73

Table 10 gives the results of wheat-variety trials conducted at Fairbanks and Delta Junction during the 1984 growing season. For both tests, fertilizers were applied in the spring with a gravity-flow, broadcast spreader and tilled into the soil during seedbed preparation. Seed was treated with Vitavax and planted at the rate of 90 lbs/acre, in rows 7 inches wide, at a depth of 1.5 inches, with a V-Belt seeder equipped with a press wheel. Weeds were controlled with a post-emergence application of Brominal. The following is a brief description of the test sites.

Fairbanks, University Farm, 1984—Fallow Land:

The test was conducted on a Tanana silt loam soil (pH 6.8) which had been cleared and in production for about 56 years. The land was summer-fallowed the previous year. Plant nutrients were supplied from urea, 10-20-20 and borax fertilizer materials at a rate of 66 lbs N/acre, 30 lbs P_2O_5 acre, 30 lbs K_2O/acre, and 0.5 lb B/acre. The plots were planted on May 15.

Delta Junction, University Research Field, 1984—Fallow Land:

The test was conducted on a Nenana silt loam soil (pH 5.8) which had been cleared for 4 years. The land had been summer-fallowed the previous year. Plant nutrients were supplied from urea, 10-20-20, and borax fertilizer materials at a rate of 90 lbs N/acre, 60 lbs P_2O_5/acre, 60 lbs K_2O/acre, and 0.5 lb B/acre. The plots were planted on May 8.

Table 10. Wheat Variety Trials Conducted at Delta Junction and Fairbanks During the 1984 Growing Season.

Variety or Experimental Line	Delta Junction University Research Farm		Fairbanks University Farm	
	Yield	Test weight	Yield	Test weight
	(bu/acre)	(lbs/bu)	(bu/acre)	(lbs/bu)
ACA 2569 MS 57-8	80	56	105	64
ACA 2570 MS 57-144	76	52	107	63
ACA 2571 MS 273-150	76	55	104	63
Chena*	80	54	85	62
Gasser*	69	56	60	60
Ingal*	64	57	68	61
Leader	70	52	70	63
Macoun	50	56	74	63
Nogal*	73	56	69	61
Park*	57	56	69	63
Taava	90	52	91	62
Tapio	84	48	112	63
Ulla	81	51	101	63
Wakooma	31	48	38	55
Wascana	48	50	69	61
Average	69	53	81	62

* Standard variety

Variety Descriptions

Standard Varieties:

CHENA is the result of a single-head selection from material originating at the Rovaniemi Agricultural Experiment Station in Finland in 1970. The Rovaniemi station is located on the Arctic Circle in Finland's far-north farming area. The parent line from which Chena was selected is uncertain. In variety trials conducted at various sites in interior Alaska, Chena has been previously referred to as "Rovaniemi Selection 70-W." Chena is a bearded variety. When ripe, straw and spike vary in color from a light tan to almost white. Chena is medium tall in height, averaging about 1 inch taller than Gasser. Under most circumstances, Chena germinates well in cold soils, tillers early in growth, and ripens uniformly. At Fairbanks, Chena matures about one day later than Gasser. Chena has a wide range of adaptation, particularly for interior Alaska. Preliminary milling and baking analyses indicate that Chena is suitable for use as a bread wheat. In 1983, Chena was the highest-yielding variety at Fairbanks and ranked third at Delta Junction. In 1984, Chena produced above-average yields at both sites.

Although Chena has not been offically released, a few farmers have been growing it on a limited scale for several years. Inquiries on the availability of seed should be directed to the Plant Materials Center or the Alaska Crop Improvement Association.

GASSER was developed in Alaska by the USDA research programs and released in 1955. Until the release of Ingal and Nogal, Gasser had been the earliest-maturing standard wheat variety included in the Tanana Valley testing program. Although yields frequently are low, Gasser has been maintained as a standard variety primarily because of its earliness. Under such adverse weather conditions as early frost or below-average growing season temperatures, Gasser will reach maturity while other varieties fail. Grain shattering of Gasser can be severe if strong winds occur during and after ripening. Lodging can also be a problem, particularly on bottomland soils or under conditions of high fertility. Gasser is a small-seeded variety that frequently has a protein content in the 18 to 20 per cent range. Gasser does not meet quality standards established by commercial millers for flour production, but small patches are often grown by individuals for grinding whole-wheat flour. Also, in the past, some acreage has been grown for use as a feed grain. In 1984, yield of Gasser was average at Delta Junction and below average at Fairbanks. Seed for this variety is available only in Alaska, and, in recent years, local supplies have been scarce. Inquiries on the availability of seed should be directed to the Alaska Crop Improvement Association.

INGAL is a fairly new spring wheat variety developed by the U.S. Department of Agriculture breeding program at Palmer, Alaska. Ingal is the result of a cross between Gasser and Morin No. 16. Ingal averages 8 inches shorter in height than Gasser and should be considered a semidwarf variety. This variety was previously tested in the Tanana Valley as an experimental line which was designated as 61 II-55-12-62-10. Ingal is the earliest wheat ever tested at Fairbanks, maturing 6 to 7 days ahead of Gasser. In 1984, yields of Ingal were low at both test sites when compared to other varieties. Ingal is satisfactory for home use in milling and baking, but has not been evaluated for commercial use. It should be considered as a feed grain at present. Inquiries on the availability of seed should be directed to the Plant Materials Center or the Alaska Crop Improvement Association.

NOGAL is a fairly new spring wheat variety developed by the U.S. Department of Agriculture breeding program at Palmer, Alaska. One of the parent lines for Nogal is Gasser. Nogal is almost as early as Ingal, maturing 5 days ahead of Gasser. In 1984, yield of Nogal was above average at Delta Junction and below average at Fairbanks. Nogal is satisfactory for home use in milling and baking but has not been evaluated for commercial use. It should be considered as a feed grain at present. Inquiries

on the availability of seed should be directed to the Plant Materials Center or the Alaska Crop Improvement Association.

PARK was registered in 1968 by the Canada Agriculture Research Station at Lacombe, Alberta. It is an early variety, maturing about 4 days later than Gasser. Park is usually the first variety to have seedlings emerge in cold soils and the first variety to flower. Park has fair resistance to lodging and shattering. Grain test weights of Park are often higher than other varieties, particularly when ripening occurs under less-than-favorable conditions. Yields of Park have been inconsistent, with a wide range when grown under different conditions. During the past 3 years, yields of Park have often been low in relation to other varieties. In 1984, yields of Park were below average at both test sites. Park seed should be available from western Canadian sources.

Test Varieties:

ACA 2569 MS 57-8 is an experimental spring wheat from the Agricultural University of Norway. It was included in the Tanana Valley trials for the first time in 1984. It is a stiff-strawed wheat that is about 2 inches shorter in height than Gasser. This wheat matures 3 to 5 days later than Gasser. In the first year of testing, it produced grain yields that were well above average at both sites. It ranked third at Fairbanks and tied with Chena for fourth at Delta Junction. It produced a very high test weight at Fairbanks, but was 4 pounds below the standard test weight at Delta Junction. Evaluation of this experimental line will continue in 1985.

ACA 2570 MS 57-144 is an experimental spring wheat from the Agricultural University in Norway. It is a short variety, averaging 8 inches less in height than Gasser. It is very resistant to lodging. It matures 3 to 5 days later than Gasser. During the first year of testing, it produced grain yields that were well above average at both sites. It ranked second at Fairbanks and tied with ACA 2571 MS 273-150 for sixth at Delta Junction. The test weight for this wheat was high at Fairbanks, but was substandard at Delta Junction. Testing of this experimental line will continue in 1985.

ACA 2571 MS 273-150 is an experimental spring wheat from the Agricultural University of Norway. It is a short variety, attaining an average height that is 8 inches less than Gasser. It is very resistant to lodging. It is the earliest of the three experimental lines from Norway, maturing at about the same time as Gasser. Grain yields for this wheat were well above average for both sites. The test weight for this wheat was high at Fairbanks but was substandard at Delta Junction. Evaluation of this experimental line will continue in 1985.

LEADER is a Canadian spring wheat variety obtained from the research station at Regina, Saskatchewan. It was tested in the Tanana Valley for the first time in 1984. This variety is similar to Park and Chena in height and has some susceptibility to lodging. It matures 7-10 days later than Chena. Yield of Leader was below average at Fairbanks, but the test weight was high. At Delta Junction, yield of Leader was near avaerage, but the test weight was low. Testing of this variety will not be continued in 1985.

MACOUN is a durum wheat which was developed in Saskatchewan. It is a stiff-strawed variety of average height. Macoun matures very late and requires a growing season that is at least 2 weeks longer than for early-maturing hard red spring wheat varieties. In 1984, Macoun produced below-average yields at both sites. However, kernel quality and test weight was very good at Fairbanks. Testing of this variety will not be continued in 1985.

TAAVA is a wheat introduction from the Hankkija Plant Breeding Institute in Finland. Taava is a stiff-straw variety that averages 37 inches in height. It matures about 6 days later than Gasser. In 1982, Taava produced the second-highest yield at Fairbanks and ranked fourth at Delta Junction. In 1983, Taava tied with Gasser for the highest yield at Delta Junction and ranked third at Fairbanks. In 1984, this variety produced the highest yield at Delta Junction and ranked sixth at Fairbanks. The test weight for Taava was substandard at Delta Junction. Evaluation of this variety will continue in 1985.

TAPIO is a wheat introduction from the Hankkija Plant Breeding Institute in Finland. This variety has good straw strength even though it averages nearly 40 inches in height. Tapio is a medium-maturing variety, requiring 8 to 9 days more growing season than Gasser. In 1982, Tapio was the highest-yielding variety at Fairbanks and ranked second at Delta Junction. In 1983, Tapio performed poorly at both locations. In 1984, Tapio produced the highest yield at Fairbanks and the second-highest yield at Delta Junction. However, the test weight for this variety was very low at Delta Junction. Testing of this variety will continue in 1985.

ULLA is a wheat introduction from the Hankkija Plant Breeding Institute in Finland. Ulla has excellent straw strength and grows to a height of 37 inches. It is a medium-maturing variety, requiring about 5 days more growing season than Gasser. In 1982, Ulla produced the third-highest yields at both test sites. In 1983, Ulla tied with Columbus for the second-highest yield at Fairbanks but performed poorly at Delta Junction. In 1984, Ulla produced the third highest yield at Delta Junction and ranked fifth at Fairbanks. However, the test weight for this variety was very low at Delta Junction. Testing of Ulla will continue in 1985.

WAKOMMA is a durum wheat developed at research stations in Regina and Swift Current, Saskatchewan. It is a stiff-strawed variety of average height. Wakooma is very late-maturing and requires 2 to 3 weeks longer to mature than early-maturing hard red spring wheat varieties. In 1984, this variety produced low yields and inferior test weights at both locations. Wakooma is not adapted to interior Alaska growing conditions

WASCANA is a durum wheat developed at research stations in Regina and Swift Current, Saskatchewan. It is 2 to 3 inches taller than average height varieties and has some susceptibility to lodging. Wascana is the earliest-maturing of the three durum wheats tested in 1984, but it is late-maturing compared to the hard red spring wheats. This variety produced below-average yields at both sites, and grain quality was poor at Delta Junction. Testing of Wascana will not be continued in 1985.

Table 11 provides a cumulative list of wheat varieties and experimental lines tested at Fairbanks and Delta Junction during the 14-year period from 1971-1984. It also gives the number of years of testing for each variety at these locations. The list does not include winter wheats.

Table 11. Wheat Varieties Tested at Fairbanks and Delta Junction, 1971-1984.

Variety or Experimental Line	Years of testing	
	Fairbanks	Delta Junction
ACA 2569 MS 57-8	1	1
ACA 2570 MS 57-144	1	1
ACA 2571 MS 273-150	1	1
Anza	1	0
Arabian	1	1
Butte	1	1
Canthatch	6	4
Capa	1	0
Carpo	1	0
Colano	2	1
Columbus	1	1
Crim	2	0
Dundas	2	2
ECM 316	1	0
Fletcher	1	0
Fortuna	1	0
Garnet	1	0
Gasser	14	14
Glenlea	0	1
Idaed	1	0
Ingal	8	8
Kharkov (spr.)	2	1
Kitt	1	0
Leader	1	1
Lemhi 66	1	0
Macoun	1	1
Manitou	4	2
Mexipak	2	1
MN 7083	1	0
MN 70113	1	0
MT 676 (Isoline)	1	0
MT 671 (Isoline)	1	0
MT 677 (Isoline)	1	0
MT 6711 (Isoline)	1	0
MT 6717 (Isoline)	1	1
MT 6721 (Isoline)	1	0
MT 6722 (Isoline)	1	0
MT 6723 (Isoline)	1	0
MT 6725 (Isoline)	1	0
MT 6727 (Isoline)	1	0
MT 6728 (Isoline)	4	4
Napayo	0	1
Neepawa	4	5
Nogal	4	4
Norana	1	1
Opal	1	0
Pac. Triple Dwarf	1	0
Park	14	14
Peak 72	0	1
Pitic 62	7	5
Polk	1	1
Rovaniemi Se. 70-W (Chena)	12	12
Ruso	8	6
Saunders	7	6
Selkrik	2	1
Sheridan	2	0
Siberian Bearded	3	2
Siberian Beardless	3	2
Sinton	2	2
Sonora 64	1	0
Springfield	0	1
Taava	3	3
Tapio	3	3
Thatcher	7	6
Thatcher (insens.)	1	0
Ulla	3	3
Vernon	2	2
Wakooma	1	1
Wascana	1	1
WS 1502	1	0
6WA 637	3	2
6WA 666	1	0
6WA 675	1	0
6WA 679	1	0
6WA 688	1	0
6WA 693	1	0
6WA 699	2	1
6WA 701	1	0
6WA 725	1	0
6WA 735	2	1
6WA 746	5	3
6WA 748	1	0
5560 II-53-1-45-2	4	4

Part II: Plant-Disease Evaluation

Jenifer Huang McBeath
Assistant Professor of Plant Pathology

Sharon Frost
Plant Pathology Research Aide

Introduction

Plant-disease surveys were conducted during the 1984 growing season. Observations were made periodically to determine types and frequency of occurrence of plant diseases infecting grain crops in the Delta-Clearwater area and in the Agricultural and Forestry Experiment Station (AFES) research plots in Delta and Fairbanks. Diseases of barley, oat, spring wheat, and winter wheat were observed in experimental plots and in farmers fields.

Snow mold is a very serious disease problem on winter wheat in Alaska. In 1982 and 1983, performance trials were conducted to evaluate the susceptibility of winter wheat germplasms (varieties and breeding lines) to snow mold disease. In these experiments, twenty-six snow mold resistant winter wheat germplasms, collected from the states of Idaho, Montana, and Washington, and five early-maturing, winter-hardy, hard red winter wheat germplasms were tested. Results of these performance trials indicated that none of the germplasms tested possessed substantial resistance to the snow mold disease complex in Alaska. In the fall of 1983, we attempted to select snow mold resistant winter wheat germplasms from the existing winter wheat gene pool. A disease survey to assess the susceptibility of these selections to the snow mold disease complex was conducted in the spring of 1984. Fungicide (terraclor=PCNB) was applied (including seed treatment, soil treatment, and foliar spray), and its effectiveness was also evaluated.

Observations of the occurrence and severity of plant diseases on various crops and the results of the snow mold experiments with winter wheat are summarized as follows.

Barley Diseases

Such barley diseases as scald (*Rhynchosporium secalis*), stripe (*Pyrenophora graminea* = *Helminthosporium gramineum*), net blotch (*Pyrenophora teres* = *Helminthosporium teres*), loose smut (*Ustilago nuda*), and spot blotch (*Cochliobolus sativus* = *Helminthosporium sativum*) were found both in the Fairbanks and Delta areas.

Barley scald, the most prevalent disease yet found on barley, was quite severe in 1984. Heavy precipitation in May, June, July, and August provided favorable conditions for the development and spread of this disease. A gradient of disease severity was observed on barley in farmers' fields. Barley scald was found to be most severe on barley grown in poorly drained soil. In such fields, barley scald was often observed on foxtail barley (*Hordeum jubatum*), a plant relatively resistant to barley scald.

Net blotch, another disease which prefers cool, humid environmental conditions, was found to be fairly severe on barley plants in Delta and Fairbanks. Spot blotch was also observed on barley, but the infection level remained low.

Barley stripe and loose smut were also found often. Because these diseases were transmitted by contaminated seed only, the severity of the diseases in the field was primarily a consequence of the seed lot used and was due less to weather conditions.

Disease occurrence and severity have been evaluated in performance trials of barley varieties on the Agricultural and Forestry Experiment Station farm in Fairbanks and on the AFES experimental plots in Delta. Table 12 lists diseases observed on barley varieties grown on experimental plots in Delta. The degree of disease manifestation on barley varieties was evaluated based on the percentage of the flag leaf surface covered by disease lesions at the watery-milky stage of grain development.

Table 12. Summary of Diseases Observed on Barley Varieties under Field Conditions in the Delta-Clearwater Area.

Barley Variety	Degree of Disease Manifestation (%)	Disease Observed[1]
Abee	2.0	scald
ACA 2561 M268	37.0	scald, stripe, net blotch
ACA 2562 P693	37.0	scald, net blotch, stripe
ACA 2563 H349-204	14.0	scald, stripe, net blotch
ACA 2564 H349-220	37.4	scald, net blotch
ACA 2565 H349-347	35.0	scald, stripe, net blotch
ACA 2566 H349-348	56.0	scald, stripe, loose smut
Argyle	8.0	scald
BT 521	4.0	scald
Datal	53.0	scald
Elrose	2.0	scald, net blotch
Empress	0.3	scald, net blotch, spot blotch
Galt	4.0	scald
Hankkija's Eero	25.0	scald
Hankkija's Pokko	24.0	scald, net blotch
Harrington	3.4	scald
HV #52	33.0	scald, spot blotch, net blotch
Jokioinen 1103	8.0	scald, spot blotch
Jokioinen 1184	30.6	scald, net blotch
Jokioinen 1315	36.0	scald
Luduc	0.2	scald, spot blotch
Norbert	1.6	scald, net blotch
Nova	52.0	scald, net blotch
Otal	18.0	scald
Otra	32.0	scald, net blotch, stripe
Paavo	19.4	scald, net blotch
Scout (hull-less)	18.4	scald, net blotch
Thual (hull-less)	12.0	scald, net blotch
Tibet (hull-less)	5.4	net blotch, scald
Weal	12.0	scald
Weal Selection	7.2	scald, smut

[1] Listed in order of frequency of observance.

Ergot (*Claviceps purpurea*) was not found in 1984. Ergot sclerotia (a hard fungal mass) contains compounds harmful to the circulatory system of humans and animals, and grain marketed through the United States is designated "Ergoty" in the Federal grading system when it contains more than 0.3 per cent ergot sclerotia by weight.

Scab, a disease caused by *Fusarium graminearum*, was observed on barley planted in 1984. However, the infection level was fairly light. Several species of Fusarium fungi have been isolated from barley that had been stored improperly under warm and humid conditions. Many species of Fusarium can produce mycotoxins such as trichothecene and zearolenone. Grains infected by Fusarium are unsavory. If large amounts of contaminated grain are used in feed, the concentraton of mycotoxins can increase to a level harmful to animals (especially swine).

Snow Mold Disease Complex on Winter Wheat and Lawn Grasses

The survey of snow mold disease complex survey conducted in spring 1984 indicated that this disease was not as prevalent as in the previous year. Although snow mold infection on winter wheat was fairly heavy, little disease damage was found on lawn grasses. Among the snow mold fungi found this year, the most prevalent species was *Sclerotinia borealis*. Sclerotial Low Temperature Basidiomycetes (sLTB) was also found often. Infection of *Fusarium nivale* on winter wheat was fairly light.

In the spring of 1983, plants that survived the winter wheat performance trials were marked. Seeds produced from these plants were collected and planted in mid-July on experimental plots at the AFES farm in Fairbanks. In the fall of 1984, readings on the number of winter wheat germinations were made. A snow mold survey was conducted in the spring of 1983, and the number of plants surviving snow mold infection in the winter of 1983-84 were recorded. Results of the snow mold survey indicated that winter wheat germplasms selected from the survivors were still very susceptible to snow mold as all of the more than 1,000 winter wheat plants germinated from selected seeds were killed by snow mold this year.

In previous studies, Terraclor (*pentachloronitrobenzene*), a low-cost organic fungicide, has been found to be effective in controlling snow mold disease complex where *S. borealis* and sLTB are the predominent snow mold fungal species. Results of this year's study indicated that foliar application of Terraclor in mid-September (before snow fall) at 10 lbs. a.i./ac is far more effective than either seed treatment or soil treatment at the same rate. Terraclor does not control Fusarium snow mold.

Diseases on Other Crops

Bacterial mosaic (*Corynebacterium tessellaria*), a new disease found in 1980, was observed again this year on spring wheat in the experimental farms at Fairbanks and Palmer. This disease is spread mostly by contaminated seeds. The contamination rates of this disease in seed lots tested were found to be as high as 100 per cent. *C. tassellaria* was found both on the surface and inside the seed. Attempts made to eliminate the bacteria from contaminated seeds, such as treating the seeds with various concentrations of chlorox, have not been very successful.

Leaf blotch (*scolecotrichum graminis*) and Alternaria blotch (*Alternaria* sp.) were also found on oat this year. Yield loss due to these diseases seemed minimal.

Diseases Observed on Crops during the 1984 Growing Season and Their Symptoms

Bacterial mosaic of spring wheat (*Corynebacterium tessellaria,* Alaska strain)

The first indication of bacteria mosaic disease in wheat is a large number of small lesions (spots) on the leaves and sheath of the plant. The color of these lesions varies from beige to orange depending on the susceptibility of the variety to this disease. As the disease progresses, these lesions grow together and form long, brown streaks.

Barley loose smut (*Ustilago nuda*)

Barley plants infected by loose smut are usually the first to head in the field. The kernels are replaced by greenish-black bodies within a delicate, silvery membrane. The membranes soon break, releasing masses of medium-brown to dark-brown powdery spores. Presence of sooty, naked spikes in the field is also an indication of loose smut infestation.

Barley net blotch (*Helminthosporium teres*)

The leaf spot varies in size and shape. Individual spots do not have definite margins. Their color is light brown; and faint, dark-brown, net-like patterns can be detected in these blotches.

Barley spot blotch (*Helminthosporium sativum*)

The leaf spots vary in size and shape. Individual spots are round or oblong with well-defined margins. Their color is uniformly dark brown. The spots later coalesce to form irregular brown stripes. Heavily infected leaves dry out and mature early. The brown spots also appear on flowers, stems, crowns, and kernels of barley plants.

Barley stripe (*Helminthosporium gramineum*)

Barley stripe appears first as a yellow striping on the leaf blades and sheaths of barley plants. The yellow stripes soon turn brown and finally dry out and become gray as the leaves mature. During the period of culm elongation, the symptoms are distinctive: as the young leaves unfold, they exhibit yellow striping; the older leaves show browning.

Ergot (*Claviceps purpurea*)

The first symptom of this disease is a sticky exudate which appears in the spikes. A blue-black, compact, hard mass of fungus develops next instead of the kernel. These hard bodies resemble the kernel but are longer and darker and very conspicuous. The ergot sclerotia contain several chemical compounds, most of which are harmful to man and animals.

Scab (*Fusarium graminearum*)

This disease can be recognized readily by the pinkish-red mycelium mass produced on the barley heads by this fungus. It not only can reduce yields, but it produces a toxin in the grain itself which can be very harmful when ingested by man or animals (particularly swine).

Snow-mold fungi (*Sclerotinia borealis* and sclerotial Low-Temperature *Basidiomycetes*)

These two fungi exhibit the same major symptom on winter wheat: after the snow melts, the infected plants are yellow in color. These plants eventually wither and die.