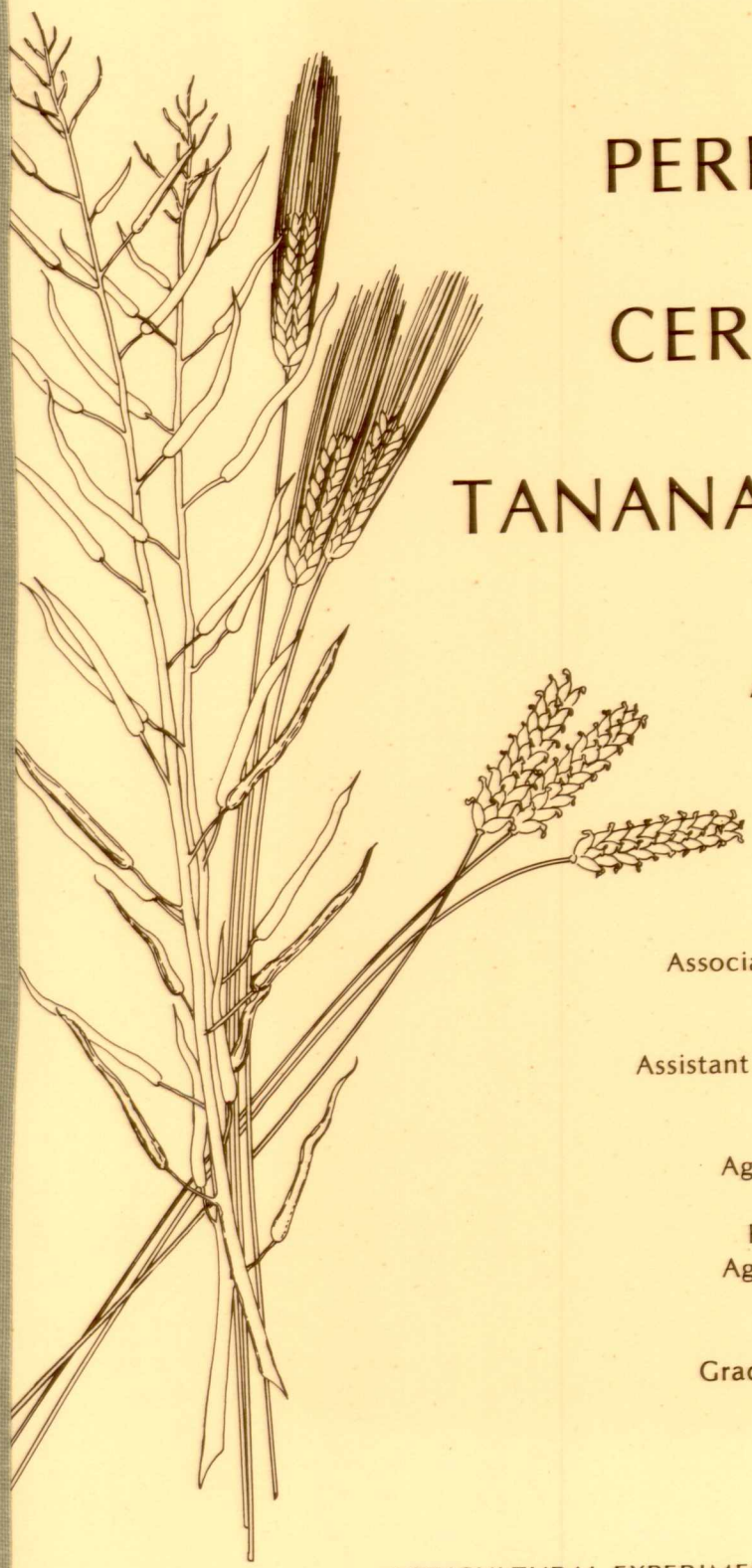

# PERFORMANCE of CEREAL CROPS in the TANANA RIVER VALLEY of ALASKA 1981

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Circular No. 42

March, 1982

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## INTRODUCTION

This is the third publication in this format on grain performance trials in the Tanana River Valley. The first, published two years ago, included the results of spring cereal variety tests conducted at Fairbanks and Delta Junction during the 1978 and 1979 growing seasons. The second, published one year ago, contained the test results from the 1980 growing season. Included in this report are a weather summary, the 1981 variety-test results, and a plant-disease section.

Previous work with grain variety testing has shown that individual varieties do not perform the same 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 best performs. 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 process 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 in 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 eleven 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 and Olli barley; Golden Rain and Cayuse oats; and Saunders, Thatcher, and Canthatch wheat, were replaced by improved varieties.

## STANDARD BUSHEL WEIGHTS AND CONVERSION 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 U. S., 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 | | |
| 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 | | |
| 1 metric ton | = | 1,000 kilograms | = | 2,205 pounds |

## TANANA VALLEY WEATHER SUMMARY

Climatic data for the 1981 growing season for Delta Junction and Fairbanks are summarized in Tables 1 and 2. Temperature and precipitation values given in parenthesis represent long-term averages for each location and are useful in determining the degree of normality of the growing season. The Delta Junction weather station is located in Delta Junction approximately 10 miles from the test site, and the Fairbanks station is located at the University of Alaska Agricultural Experiment Station Farm about 400 yards from the test site.

**Table 1. Climatic Data for Delta Junction during the 1981 Growing Season.**

| | May | | June | | July | | August | | September | |
|---|---|---|---|---|---|---|---|---|---|---|
| Temp. (°F) | | | | | | | | | | |
| daily max. | 65.0 | (57.1)* | 65.2 | (67.1) | 65.7 | (69.1) | 64.3 | (64.0) | 50.9 | (51.8) |
| daily min. | 43.4 | (36.9) | 46.5 | (47.1) | 50.1 | (50.1) | 46.4 | (45.6) | 35.6 | (35.3) |
| daily mean | 54.3 | (47.0) | 55.9 | (57.1) | 57.9 | (59.6) | 55.4 | (54.8) | 43.3 | (43.6) |
| Precip. (in.) | 1.62 | (0.86) | 2.43 | (2.26) | 2.94 | (2.68) | 0.62 | (2.00) | 0.75 | (1.24) |

*Values in parentheses represent a 24-year average.

**Table 2. Climatic Data for Fairbanks during the 1981 Growing Season.**

| | May | | June | | July | | August | | September | |
|---|---|---|---|---|---|---|---|---|---|---|
| Temp. (°F) | | | | | | | | | | |
| daily max. | 67.4 | (60.2)* | 69.5 | (71.7) | 66.1 | (72.7) | 66.6 | (67.3) | 52.7 | (55.4) |
| daily min. | 38.7 | (33.6) | 42.3 | (44.1) | 46.4 | (46.8) | 40.5 | (43.0) | 33.7 | (33.6) |
| daily mean | 53.1 | (46.9) | 55.9 | (57.9) | 56.3 | (59.8) | 53.5 | (55.2) | 43.2 | (44.5) |
| Precip. (in.) | 0.40 | (0.80) | 2.44 | (1.48) | 4.15 | (2.10) | 1.30 | (2.44) | 1.10 | (1.36) |

*Values in parentheses represent a 34-year average.

The Delta Junction recording station received near-normal total precipitation for the 1981 growing season. For the period May through September, Delta Junction received 8.36" as compared to 9.04" for the long-term average. The slight deficit of 0.68" amounted to about 8% of its seasonal average. Above-normal rainfall was recorded in May, June, and July but deficits occurred in August and September. The above-normal rainfall early to midway in the growing season allowed spring-applied fertilizer, particularly phosphorus, to dissolve and thus become available for plant growth. This combination of adequate supplies of moisture and nutrients was highly favorable for vegetative growth. Although precipitation for August and September was below average, there were 31 days during the two-month period when a trace or more of precipitation was recorded. This high frequency of precipitation contributed to slower ripening and resulted in higher-than-normal grain moisture contents during harvest.

Growing season temperatures at Delta Junction were well above average for May, cooler than normal for June and July, and near normal for August and September. Daily maximum temperatures for July averaged 3.4 degrees below normal. July was characterized by cloudy wet weather in which a trace or more of precipitation was recorded on 26 out of 31 days. The sun made only rare appearances during the entire month. July is a critical period of the growing season with regard to grain kernel development and maturation. The cool July temperatures caused crop maturity to be nearly two weeks behind that normally expected for the area as the growing season enters the first week of August. For some fields of grain, the July weather also caused

renewed vegetative growth in the form of late tillers. The combination of delayed maturity and late tillering made crops more susceptible to freeze damage when temperatures dropped to the low twenties in mid-August. For many fields, this combination of conditions made swathing a necessary operation in order to begin harvesting at an anywhere-near-normal time.

Total precipitation for the 1981 growing season, May through September, was above normal at the Fairbanks recording station. Fairbanks received 9.39" as compared to 8.18" for the long-term average. June and July had nearly double the normal rainfall which more than compensated for the deficits received during the months of May, August, and September.

Overall, the Fairbanks growing season was the coldest on record. After starting out the season with a very warm May, the next four months were cooler than normal. The most striking deviation from normal occurred in July when daily maximum temperatures averaged 6.6 degrees below the long-term average. The first frost was received on August 17, but did not cause serious damage to grain crops. The cool temperatures caused most grain crops to mature two to three weeks later than normal.

## 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 and pearling barleys.

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, Lidal,* and *Weal* 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. Of the four varieties, Otra is the only one that has some quality characteristics which indicate possible use as a malting barley. Otra is the earliest maturing of the standards, with Lidal, Weal, and Galt maturing 1, 4, and 9 days later, respectively. Yield data for Galt, Lidal, and Weal have been collected at Fairbanks since 1971 and at Delta Junction since 1972. Otra was included in the testing program at both locations beginning in 1973. 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, 1971-1981.**

| Location | Grain Yield (bu/acre) | | | |
|---|---|---|---|---|
| | Galt | Otra | Lidal | Weal |
| Fairbanks | | | | |
| Average Yield | 91 | 79 | 68 | 77 |
| Range of Yields | 59 - 127 | 50 - 99 | 46 - 91 | 43 - 125 |
| Delta Junction | | | | |
| Average Yield | 69 | 80 | 63 | 61 |
| Range of Yields | 30 - 101 | 48 - 123 | 27 - 92 | 31 - 83 |
| Fairbanks and Delta Junction | | | | |
| Average Yield | 80 | 80 | 65 | 69 |
| Range of Yields | 30 - 127 | 48 - 123 | 27 - 92 | 31 - 125 |

Table 4 gives the results of barley variety trials conducted at Fairbanks and Delta Junction during the 1981 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" wide, at a depth of 1.5", 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, 1981 — Fallow Land

The test was conducted on a Tanana silt loam soil (pH 7.2) which has been cleared and in production for over 50 years. The land was summer fallowed the previous year. Plant nutrients were supplied from urea and 10-20-20 fertilizer materials at a rate of 66 lbs/acre N, 30 lbs/acre $P_2O_5$, and 30 lbs/acre $K_2O$. The plots were planted on May 12.

### Delta Junction, Lee Fett's Farm, 1981 — Fallow Land

The test was conducted on a Richardson silt loam soil (pH 5.7) which had been cleared and in production for over 20 years. The land was summer fallowed the previous year. Plant nutrients were supplied at a rate of 80 lbs/acre N, 40 lbs/acre $P_2O_5$, and 40 lbs/acre $K_2O$ from urea and 10-20-20 fertilizer materials. The plots were planted on May 6.

**Table 4. Barley Variety Trials Conducted at Delta Junction and Fairbanks During the 1981 Growing Season.**

| Variety or Experimental Line | Delta Junction Lee Fett's Farm | | Fairbanks University Farm | |
|---|---|---|---|---|
| | Yield (bu/acre) | Test Weight (lbs/bu) | Yield (bu/acre) | Test Weight (lbs/bu) |
| Advance | 65 | 34 | 79 | 36 |
| Bedford | 79 | 41 | 110 | 44 |
| Datal | 78 | 48 | 96 | 45 |
| Exp HV No. 9 | 54 | 40 | 72 | 45 |
| Exp HV No. 14 | 34 | 45 | 107 | 49 |
| Fairfield | 66 | 47 | 125 | 49 |
| Galt* | 76 | 42 | 85 | 43 |
| Hankkija's Eero | 98 | 46 | 87 | 46 |
| Johnston | 83 | 42 | 101 | 45 |
| Lidal* | 77 | 46 | 86 | 42 |
| Lud | 58 | 40 | 121 | 51 |
| Massey | 46 | 36 | 76 | 41 |
| Melvin | 99 | 43 | 84 | 38 |
| Mingo | 48 | 42 | 109 | 43 |
| Onda | 71 | 39 | 68 | 35 |
| Otal | 87 | 50 | 74 | 46 |
| Otra* | 80 | 48 | 97 | 44 |
| Paavo | 80 | 45 | 98 | 46 |
| Polaris | 85 | 47 | 96 | 45 |
| Summit | 62 | 43 | 116 | 49 |
| Triumph | 48 | 38 | 120 | 48 |
| Weal* | 55 | 41 | 86 | 38 |
| Windsor | 76 | 38 | 140 | 43 |
| Average | 70 | 43 | 97 | 44 |

*Standard variety.

## Variety Descriptions

### Standard Varieties

*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 9 or 10 days later than Otra, the earliest of the four 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 (before May 21 and definitely no later than May 24) is possible and in areas subject to high winds. 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.

*LIDAL* is a 6-rowed variety developed at the U. S. Department of Agriculture at Palmer. It is a selection from a cross between Edda and Olli. It is early maturing, averaging 1 day later than Otra. Like Otra, Lidal has only fair resistance to lodging and head shattering. Field losses due to head shattering can be greatly reduced by swathing. Best performances of Lidal have been obtained when planted in late May. If the planting season is extended into June, Lidal is a good variety to finish up with. With early- and mid-May planting dates, Lidal is usually outperformed by Galt and Otra. Lidal has the highest protein content of the four standard varieties. The protein content of Lidal usually runs 2 to 4% higher than Otra and Galt and 1 to 3% higher than Weal. Inquiries on the availability of seed should be directed to the Alaska Crop Improvement Association or the Plant Materials Center at Palmer, Alaska.

*OTRA* is a 6-rowed variety that originated in Finland and is still widely grown in that country. It is the earliest maturing of the standards 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. 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 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 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 4 days later than Otra 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 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. Inquiries on the availability of seed should be directed to the Alaska Crop Improvement Association or the Plant Materials Center.

## Test Varieties

*ADVANCE* is a new 6-rowed barley developed at Washington State University. It is a short variety, with heights averaging 9 inches less than Galt. It matures about the same time as Galt. In 1981, at both test sites, Advance produced less than average yields and had very low test weights. Advance is poorly adapted to Tanana Valley growing conditions.

*BEDFORD* is a 6-rowed feed barley developed at the Agriculture Canada Research Station, Brandon, Manitoba. Bedford was included in the Tanana Valley performance trials for the first time in 1981. It is a late maturing variety, requiring about 14 days longer than Otra. At both test sites, Bedford produced above average yields but had poor test weights. Because of its late maturity and low test weight, there will be no further evaluation of this variety.

*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-row 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 71II-67-22-5. Datal is a very early barley, maturing 1 or 2 days ahead of Otra and Lidal. It is highly adapted to growing conditions in the Tanana Valley. Inquiries on the availability of seed should be directed to the Plant Materials Center or the Alaska Crop Improvement Association.

*EXP HV NO. 9* is a 6-rowed malting barley from the Wilber-Ellis Company of Spokane, Washington. This barley line is still in the experimental stages of development. In 1981, yields of Exp. HV No. 9 were well below average at both interior Alaska locations and maturity was in the medium to late range. Testing of this line will not be continued in 1982.

*EXP HV NO. 14* is a 2-rowed malting barley from the Wilber-Ellis Company of Spokane, Washington. Like Exp. HV No. 9, this is an experimental line. In 1981, Exp. HV No. 14 performed poorly at Delta Junction but produced above-average yields at Fairbanks. Under Tanana Valley conditions, Exp. HV No. 14 was rated as medium to late in maturity. Testing of this line will not be continued in 1982.

*FAIRFIELD* is a 2-rowed malting barley developed at Lethbridge, Alberta from a cross between Firlbecks III and Betzes. During 3 years of Tanana Valley testing, Fairfield has been the earliest of the 2-rowed types, maturing about the same time as Galt. It has good resistance to lodging and shattering. It has consistently produced good bushel weights, but yields have frequently been mediocre. This variety should be considered by farmers if quality, as measured by test weights, is a more important factor than yield. Seed for Fairfield should be available from suppliers in the western provinces of Canada.

*HANKKIJA'S EERO* is a 6-rowed barley from Finland that has been included as an entry in the Tanana Valley testing program for the past 4 years. Its performance has been very 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. Hankkija's Eero is a semidwarf variety, averaging only 24" in height, or about 13" 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 minimal-tillage and no-tillage farming practices in the Delta Junction area. An initial seed increase of 10 bushels was performed by the Plant Materials Center in 1981.

*JOHNSTON* is a new 6-rowed feed barley developed by the Agriculture Canada Research Station, Brandon, Manitoba. Johnston was previously tested as an experimental line which was designated as BT 334. Johnston grows 2 to 3 inches taller than Galt and matures about 2 days later than Galt. This variety has shown some resistance to scald disease in tests conducted at Beaverlodge, Alberta and in the Tanana Valley. In 1981, Johnston produced above average yields at Fairbanks and Delta Junction. However, test weights at both sites were substandard. Testing of Johnston will be continued in 1982.

*LUD* is a 2-rowed feed barley that has produced very high yields in Montana, Idaho, and Colorado. It was bred in England by Rothwell plant breeders and developed for the U. S. by North American Plant Breeders. In 1980, Lud was the latest-maturing variety tested in the Tanana Valley. It matured 16 days later than Otra and 7 days later than Galt. Lud produced good yields and high bushel weights at both Fairbanks and Delta Junction. In 1981, Lud continued to perform well at Fairbanks but did very poorly at Delta Junction. This variety warrants continued testing.

*MASSEY* is a new 6-rowed feed barley developed by the Ontario Cereal Crops Committee and maintained by the Ottawa Research Station, Agriculture Canada. Massey grows to about the same height as Galt but matures 5 to 6 days later. At both Tanana Valley test sites, in 1981, yields were well below average and test weights were substandard. Massey is not adapted to interior Alaska growing conditions.

*MELVIN* is a 6-rowed feed barley from the University of Saskatchewan. It matures about 2 days later than Galt, a parent variety. In 1979, Melvin was outperformed by Galt in the Tanana Valley tests. However, in 1980, the exact opposite occurred. Yield of Melvin exceeded Galt at both the Fairbanks and Delta Junction test sites. In 1981, Melvin was the highest yielding variety at Delta Junction but its test weight was substandard. Melvin had good resistance to lodging and shattering. Farmers who want to try this variety for the first time should exercise caution. Melvin should be planted early, preferably before mid-May, and only on small acreage.

*MINGO* is a new 6-rowed feed barley developed and maintained by CIBA-GIEGY Seeds, Ltd., Ailsa Craig, Ontario. Mingo grows several inches taller than Galt and matures about 5 days later than Galt. In 1981, yield of Mingo was well below average at Delta Junction and slightly above average at Fairbanks. Bushel weights were low at both test sites. Because of its mediocre performance, there will be no further testing of this variety.

*ONDA* is a 4-rowed barley developed by the Wilber-Ellis Company of Spokane, Washington. This variety has demonstrated very early maturity in some areas of the Pacific Northwest and Canada. In 1981, Onda was the first variety to head (flower) at both Tanana Valley test sites. However, early heading did not result in early maturity. Onda matured about the same time as Galt. Yield of Onda was about average at Delta Junction and well below average at Fairbanks. Bushel weights at both locations were considerably less than the standard.

*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 as designated as 71II-67-18-57. Otal is a very early barley, maturing 2 or 3 days ahead of Otra and Lidal. It is highly adapted to growing conditions in the Tanana Valley, particularly the Delta-Clearwater area. At the Delta Junction test site, in 1981, Otal ranked third in yield and had the highest test weight of the 23 varieties evaluated. Inquiries on the availability of seed should be directed to the Plant Materials Center or the Alaska Crop Improvement Association.

*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 has produced respectable yields in 1979, 1980, and 1981. It is a fairly early variety, maturing 1 to 2 days later than Otra. Paavo appears to be a slight improvement over Otra for resistance to lodging and head shattering. An initial seed increase of 10 bushels was performed by the Plant Materials Center in 1981.

*POLARIS* is a 6-rowed feed barley developed at Beaverlodge, Alberta, from a cross between Jubilee and Olli. This variety has produced outstanding yields in the Peace River Region of Alberta and appears to have some tolerance to acid soils. Polaris has been tested in the Tanana Valley in 1980 and 1981. Under Tanana Valley conditions, Polaris requires about the same length of time to mature as Galt but ripens more uniformly than Galt. In 1980, Polaris was outperformed by Galt at both test sites. However, in 1981, Polaris was superior to Galt at the two locations. Testing of Polaris will continue in 1982.

*SUMMIT* is a 2-rowed feed barley developed by North American Plant Breeders. It is very adapted to the Red River Valley in Manitoba. It is a short, stiff-strawed variety that matures 5 to 7 days later than Galt. During 3 years of Tanana Valley testing, Summit has produced some high yields and heavy test weights. In 1980, Summit was the highest-yielding variety at the Delta Junction test sites. However, in 1981, Summit's performance at Delta Junction was disappointing. Its yield dropped to the lowest third of the 23 varieties evaluated. Performance of Summit at Fairbanks continued to be good. To grow this variety successfully in the Tanana Valley, it should be planted before May 10, and the farmer should be prepared to do considerable drying at harvest.

*TRIUMPH* is a 2-rowed barley that was bred in East Germany. During the last 3 years it has produced exceptionally high yields in tests conducted in England and Scotland. Triumph is a late-maturing variety. In 1980 and 1981, it matured 14 days later than Otra and 5 days later than Galt. In 1980, it was the second highest yielding variety at Delta Junction but ranked 14th out of the 19 varieties tested at Fairbanks. In 1981, the performance of this variety was reversed at the two locations: Triumph performed very poorly at Delta Junction, but was the fourth highest yielding variety at Fairbanks. This variety warrants continued testing.

*WINDSOR* is a 6-rowed feed barley developed by the University of Alberta. Windsor is a late-maturing variety, requiring 3 to 5 days longer than Galt. It has good resistance to shattering but is susceptible to some lodging. Windsor has some resistance to scald disease. During 3 years of evaluation, Windsor has outperformed Galt in 3 out of 6 tests. Farmers who want to try this variety for the first time should exercise caution. Windsor should be planted in early May, and only on small acreage.

Table 5 provides a cumulative list of all the barley varieties and experimental lines tested at Fairbanks and Delta Junction during the 11-year period from 1971 to 1981. It also gives the number of years of testing for each variety at these locations.

**Table 5. Barley Varieties Tested at Fairbanks and Delta Junction, 1971-1981.**

| Variety or Experimental Line | Years of Testing | |
|---|---|---|
| | Fairbanks | Delta Junction |
| Advance | 1 | 1 |
| Amy | 1 | 1 |
| Balder | 3 | 2 |
| Beacon | 1 | 1 |
| Bedford | 1 | 1 |
| Belle | 1 | 1 |
| Betzes | 6 | 5 |
| 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 |
| Carlsberg II | 1 | 1 |
| Cathy | 1 | 1 |
| Centennial | 1 | 2 |
| Conquest | 2 | 0 |
| Cree | 1 | 1 |
| Dickson | 1 | 0 |
| Dolores | 1 | 1 |
| Early Carlsberg II | 1 | 1 |
| Early Freja | 1 | 1 |
| Early Hannchen | 1 | 1 |
| Edda | 7 | 6 |
| Erbet | 1 | 1 |
| Ershabet | 2 | 2 |
| Exp HV No. 9 | 1 | 1 |
| Exp HV No. 14 | 1 | 1 |
| Fairfield | 2 | 3 |
| Fergus | 2 | 0 |
| Firlbecks III | 2 | 1 |
| Freja | 1 | 1 |
| Frontier | 1 | 0 |
| Galt | 11 | 10 |
| Gateway 63 | 4 | 4 |
| Hankkija 673 | 1 | 2 |
| Hankkija's Eero | 3 | 4 |
| Hannchen | 1 | 1 |
| Herta | 1 | 0 |
| Hiland | 1 | 0 |
| Hyproly | 1 | 0 |
| Hyproly Normal | 1 | 0 |
| Jubilee | 4 | 4 |
| Karl | 1 | 1 |
| Klondike | 1 | 2 |
| Larker | 1 | 1 |
| Lidal | 11 | 10 |
| Lot EX 1-N | 1 | 1 |
| Lud | 2 | 2 |
| Mari | 2 | 2 |
| Massey | 1 | 1 |
| Melvin | 2 | 3 |
| Mingo | 1 | 1 |
| Moravian III | 1 | 1 |
| NRGB 79-2 | 1 | 1 |
| Olli | 6 | 5 |
| Onda | 1 | 1 |
| Otis | 2 | 0 |
| Otra | 7 | 9 |
| Paavo | 3 | 4 |
| Palliser | 4 | 2 |
| Paragon | 2 | 0 |
| Parkland | 2 | 0 |
| Piroline | 3 | 2 |
| Polaris | 2 | 2 |
| Prilar | 1 | 0 |
| Primus II | 2 | 1 |
| Rovaniemi Sel. 70-B (Finnaska) | 6 | 5 |
| Shabet | 5 | 6 |
| Stanka | 3 | 1 |
| Steptoe | 3 | 3 |
| Strom | 1 | 1 |
| Summit | 2 | 3 |
| Tibet Hulless | 3 | 1 |
| Trebi | 1 | 0 |
| Triumph | 2 | 2 |
| Trophy | 1 | 0 |
| Unitan | 1 | 0 |
| Vale 70 | 1 | 1 |
| Weal | 11 | 10 |
| 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-67-18-57 (Otal) | 3 | 3 |
| 71 II-67-19-91 | 1 | 0 |
| 71 II-67-21-111 | 1 | 0 |
| 71 II-67-22-5 (Datal) | 3 | 3 |
| 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 as 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 not so critical. Oats planted between June 1 and June 15 often grow taller and produce more forage than earlier plantings.

*Nip, Pendek, Rodney,* and *Toral* are considered the standard varieties for Tanana Valley. Yield data for these varieties have been collected at Fairbanks since 1971 and at Delta Junction since 1972. Rodney, Nip, and Toral have been included in the tests since 1971. Pendek was added in 1972. 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, 1971-1981.**

| Location | Grain Yield (bu/acre) | | | |
|---|---|---|---|---|
| | Nip | Pendek | Rodney | Toral |
| Fairbanks | | | | |
| Average Yield | 123 | 118 | 139 | 134 |
| Range of Yields | 52 - 159 | 50 - 167 | 63 - 178 | 67 - 179 |
| Delta Junction | | | | |
| Average Yield | 104 | 117 | 102 | 122 |
| Range Yields | 45 - 145 | 53 - 208 | 51 - 170 | 52 - 179 |
| Fairbanks and Delta Junction | | | | |
| Average Yield | 114 | 118 | 120 | 128 |
| Range of Yields | 45 - 159 | 50 - 208 | 51 - 178 | 52 - 179 |

Table 7 gives the results of oat variety trials conducted at Fairbanks and Delta Junction during the 1981 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" wide, at a depth of 1.5", 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 1981 Growing Season.**

| Variety | Delta Junction Lee Fett's Farm | | Fairbanks University Farm | |
|---|---|---|---|---|
| | Yield (bu/acre) | Test Weight (lbs/bu) | Yield (bu/acre) | Test Weight (lbs/bu) |
| Athabasca | 159 | 32 | 115 | 38 |
| Cascade | 174 | 32 | 164 | 39 |
| Cavell | 132 | 33 | 163 | 39 |
| Foothill | 116 | 28 | 169 | 36 |
| Laurent | 133 | 32 | 155 | 39 |
| Nip* | 148 | 32 | 153 | 35 |
| Pendek* | 137 | 31 | 121 | 35 |
| Rodney* | 122 | 31 | 179 | 39 |
| Toral* | 161 | 33 | 180 | 42 |
| Victory | 119 | 30 | 160 | 38 |
| Average | 140 | 31 | 156 | 38 |

*Standard variety.

### Fairbanks, University Farm, 1981 – Fallow Land

The test was conducted on a Tanana silt loam soil (pH 7.2) which had been cleared and in production for over 50 years. The land had been summer fallowed the previous year. Plant nutrients were supplied at a rate of 66 lbs/acre N, 30 lbs/acre $P_2O_5$, and 30 lbs/acre $K_2O$ from urea and 10-20-20 fertilizer materials. The plots were planted on May 5.

### Delta Junction, Lee Fett's Farm, 1981 – Fallow Land

The test was conducted on a Richardson silt loam soil (pH 5.8) which had been cleared and in production for over 20 years. The land had been summer fallowed the previous year. Plant nutrients were supplied from urea and 10-20-20 fertilizer materials at a rate of 80 lb/acre $P_2O_5$, and 40 lbs/acre $K_2O$. The plots were planted on May 7.

## Variety Descriptions

### Standard Varieties

***NIP*** is a black-hulled 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 suppliers have been scarce. Inquiries on the availability of seed should be directed to the Alaska Crop Improvement Association.

*PENDEK* was developed in Holland and has become popular in several areas of Canada. It is a short, stiff-strawed variety that matures 3 to 5 days later than Nip. It has very good resistance to lodging and grain shattering. Pendek has yielded exceptionally well when grown under high fertility. Its height averages 6 to 7" shorter than Rodney, Nip, and Toral. Pendek is recommended for grain production only. In the 1980 performance trials, Pendek was the highest-yielding variety at Delta Junction and the lowest yielding at Fairbanks. In 1981, Pendek's performance was below average at both test sites. Pendek seed is available from Canadian seed suppliers.

*RODNEY* is a fairly old variety developed in Winnipeg, Manitoba. For nearly 20 years it has been a popular oat in grain-producing areas of Canada, the Rocky Mountain states, and North Dakota. Many of the newer varieties have been developed from crosses with Rodney. It is a medium- to late-maturing variety which has produced very high grain and forage yields at Fairbanks and Delta Junction. In 1981, Rodney produced the highest grain yield at Fairbanks, but ranked number eight at Delta Junction. It is resistant to grain shattering, but some lodging may occur on highly fertile soils. Rodney grows to about the same height as Nip, but matures 7 to 10 days later. Since Rodney 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. Rodney is recommended primarily for forage production. Seed for this variety is usually available from Canadian and West Coast seed suppliers.

*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 1981, grain yields of Toral ranked number one at Fairbanks and number two at Delta Junction. Seed for this variety is available only in Alaska. Seed inquiries should be directed to the Alaska Crop Improvement Association.

### Test Varieties

*ATHABASCA* is a very early maturing, Canadian variety. It is a fairly new release and was first included as an entry in the Tanana Valley trials in 1979. It is the first yellow-oat variety to mature as early as Nip and shows promise of yielding as much as Nip. In 1981, Athabasca yielded 11 bushels per acre more than Nip at Delta Junction, but produced 38 bushels per acre less than Nip at Fairbanks. Athabasca is several inches shorter than Nip and has greater resistance to lodging and shattering. Athabasca should be considered as a highly suitable, early-maturing variety for Delta Junction. Its performance at Fairbanks has been inconsistent. Athabasca should be widely available from seed suppliers in the Peace River Region of Alberta.

*CASCADE* is a new, high-yielding oat variety developed at the Canada Research Station, Lacombe, Alberta. This oat was included in the Tanana Valley testing program for the first time in 1981. At Delta Junction, Cascade was the highest yielding variety tested. Cascade exceeded Toral, the highest-yielding standard, by 8.1%. At Fairbanks, Cascade produced a respectable yield and ranked 4th out of the 10 varieties evaluated. Cascade is similar to Rodney in height and maturity, but has greater resistance to lodging. Seed for this variety should be widely available from western Canadian seed suppliers.

*CAVELL* is a Canadian variety that has performed well in Tanana Valley tests conducted between 1978 and 1981. Cavell's poorest performance year with regard to yields was 1981, when this variety ranked 7th at Delta Junction and 5th at Fairbanks. It matures about 2 days earlier than Rodney and has good resistance to lodging and grain shattering. Plant height of Cavell averages about 2" less than Rodney. This variety is available from Canadian seed suppliers.

*FOOTHILL* is a new forage oat from Canada that grows 3 to 4" taller than Rodney and matures about 4 days later than Rodney. This variety has been tested for the past 3 years. In 1979, grain yields were fair and lodging was slight. In the 1980 tests, Foothill was the 2nd highest yielding variety at Delta Junction and ranked 5th at Fairbanks. In 1981, Foothill was the lowest-yielding variety at Delta Junction but ranked as the 3rd highest at Fairbanks. Seed for this variety can be obtained from Canadian sources.

*LAURENT* is a new variety developed for eastern Canada. It originated at MacDonald College of McGill University and was developed by the Quebec Oat Project Group. One of the parent varieties of Laurent is a cross between Glen and Gary. Glen and Gary have performed well in interior Alaska during past years of testing. Grain yields of Laurent during 2 years of Tanana Valley testing have been mediocre. This variety performs better at Fairbanks than at Delta Junction. Laurent matures about the same time as Toral and is similar in height.

*VICTORY* is an old variety that was quite popular at one time in the Tanana Valley. It is a tall-growing, weak-strawed, late-maturing variety that is considered to be highly suitable as a forage oat. In 1981, grain yields of Victory ranked in the lower half of the 10 varieties evaluated at both the test sites. Seed for Victory is still available from Canadian and West Coast U. S. sources.

Table 8 provides a cumulative list of all the oat varieties and experimental lines tested at Fairbanks and Delta Junction during the 11-year period from 1971-1981. 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, 1971-1981.**

| Variety or Experimental Line | Years of Testing | | Variety or Experimental Line | Years of Testing | |
|---|---|---|---|---|---|
| | Fairbanks | Delta Junction | | Fairbanks | Delta Junction |
| Astro | 1 | 1 | Markton | 1 | 0 |
| Athabasca | 2 | 3 | Nip | 11 | 10 |
| Cascade | 1 | 1 | Orbit | 2 | 2 |
| Cavell | 6 | 5 | Pendek | 10 | 10 |
| Cayuse | 6 | 5 | Random | 6 | 5 |
| Ceal | 6 | 5 | Rapida | 1 | 0 |
| Cherokee | 1 | 0 | Rodney | 11 | 10 |
| Chief | 1 | 1 | Rovaniemi Sel. | | |
| Cody II | 1 | 0 | (Orion) | 2 | 2 |
| Eagle | 3 | 3 | Russell | 2 | 1 |
| Foothill | 2 | 3 | Sioux | 4 | 3 |
| Frazer | 5 | 5 | Spear | 1 | 1 |
| Garry | 2 | 1 | Terra | 1 | 2 |
| Gemini | 0 | 1 | Toral | 11 | 10 |
| Glen | 5 | 4 | Vicland | 1 | 0 |
| Golden Rain | 3 | 2 | Victory | 5 | 5 |
| Grizzly | 4 | 4 | 61 II-55-21-25-8 | 1 | 1 |
| Harmon | 6 | 5 | 61 II-55-21-58-14 | 1 | 1 |
| Hinoat | 0 | 1 | 61 II-55-21-15-5 | 6 | 5 |
| Hudson | 4 | 3 | 65 II-58-10-4-3 | 1 | 1 |
| Kelsey | 4 | 3 | 65 X-58-26-3-2 | 1 | 1 |
| Laurent | 2 | 2 | 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,* and *Chena* 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 several 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 in the testing program at both locations, beginning in 1973. 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, 1971-1981.**

| Location | Grain Yield (bu/acre) | | |
|---|---|---|---|
| | Gasser | Park | Chena |
| Fairbanks | | | |
| Average Yield | 51 | 57 | 70 |
| Range of Yields | 33-69 | 25-74 | 46-87 |
| Delta Junction | | | |
| Average Yield | 34 | 33 | 43 |
| Range of Yields | 21-47 | 16-55 | 27-62 |
| Fairbanks and Delta Junction | | | |
| Average Yield | 43 | 44 | 56 |
| Range of Yield | 21-69 | 16-74 | 27-87 |

Table 10 gives the results of wheat-variety trials conducted at Fairbanks and Delta Junction during the 1981 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" wide, at a depth of 1.5", 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, 1981 – Fallow Land**

The test was conducted on a Tanana silt loam soil (pH 7.0) which had been cleared and in production for over 50 years. The land was summer fallowed the previous year. Plant nutrients were supplied at a rate of 66 lbs/acre N, 30 lbs/acre $P_2O_5$, and 30 lbs/acre $K_2O$ from urea and 10-20-20 fertilizer materials. The plots were planted on May 5.

**Delta Junction, Lee Fett's Farm, 1981 – Fallow Land**

The test was conducted on a Richardson silt loam soil (pH 5.7) which had been cleared and in production for over 20 years. The land was summer fallowed the previous year. Plant nutrients were supplied from urea and 10-20-20 fertilizer materials at the rate of 80 lbs/acre N, 40 lbs/acre $P_2O_5$, and 40 lbs/acre $K_2O$. The plots were planted on May 7.

**Table 10. Wheat Variety Trials Conducted at Fairbanks and Delta Junction During the 1981 Growing Season.**

| Variety | Delta Junction Lee Fett's Farm | | Fairbanks University Farm | |
|---|---|---|---|---|
| | Yield (bu/acre) | Test Weight (lbs/bu) | Yield (bu/acre) | Test Weight (lbs/bu) |
| Chena* | 34 | 47 | 76 | 59 |
| Dundas | 30 | 44 | 79 | 59 |
| Gasser* | 40 | 48 | 53 | 55 |
| Ingal | 30 | 51 | 63 | 57 |
| Neepawa | 27 | 45 | 61 | 61 |
| Nogal | 36 | 47 | 59 | 59 |
| Park* | 28 | 51 | 62 | 61 |
| Polk | 18 | 43 | 45 | 61 |
| Ruso | 33 | 43 | 83 | 61 |
| Vernon | 29 | 39 | 82 | 57 |
| Average | 31 | 46 | 66 | 59 |

* 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 the farthest-north farming area of Finland. 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" 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.

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. It is 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 adverse weather conditions such 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 protein contents in the 18 to 20% 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. Seed for this variety is available only in Alaska and, in recent years, local suppliers have been scarce. Inquiries on the availability of seed should be directed to 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 weight of Park is 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 1980 and 1981, yields of Park have been generally low in relation to other varieties. Park seed should be available from western Canadian sources.

### Test Varieties

*DUNDAS* and *VERNON* are two new spring wheats developed in eastern Canada at the Agriculture Canada Research Station, Charlottetown, Prince Edward Island. Both varieties share 'Opal' wheat as a common parent. Opal was grown on small acreages in the Tanana Valley during the 1960s. Both varieties are classified as feed wheats because of inferior milling and baking quality. In the Tanana Valley, Dundas and Vernon mature 8 to 10 days later than Gasser. In the 1980 tests, Dundas was the second highest yielding variety at Delta Junction, but ranked in the lowest third at Fairbanks. In these same tests, Vernon was the highest-yielding variety at Delta Junction and third highest at Fairbanks. In 1981, Vernon and Dundas produced the second and third highest yields at Fairbanks, respectively. However, both varieties performed poorly at Delta Junction.

*INGAL* is a newly released 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 1981, Ingal outyielded Gasser by 10 bushels per acre at Fairbanks, but produced 10 bushels per acre less than Gasser at Delta Junction. 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.

*NEEPAWA* is a fairly new Canadian release that has rapidly become the most popular wheat variety grown in the Peace River Region of Alberta and British Columbia. It was first used in the Tanana Valley trials in 1979. Its performance was good with regard to yield and maturity. Neepawa is a beardless variety that matures about 5 days later than Gasser and grows to about the same height. It is stiff strawed, resistant to shattering, and continues to ripen under cool-wet conditions. Yields of Neepawa have been higher than Park and Gasser, but lower than Chena. In 1980, Neepawa was the only wheat at the Delta Junction test site to have a bushel weight over 60 pounds. Indications are that this wheat will maintain good quality over a wide range of growing conditions. An exception to this occurred at Delta Junction in 1981 when Neepawa was severely damaged by an August freeze. The low temperatures resulted in reduced yield, shriveled kernels, and a low test weight. Neepawa should be widely available from western Canadian seed suppliers.

*NOGAL* is a 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. At Fairbanks, during 1981, Nogal matured about 5 days earlier than Gasser and outyielded Gasser by 6 bushels per acre. Yield of Gasser exceeded Nogal by 4 bushels per acre at Delta Junction. 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.

*POLK* is an older variety of hard red spring wheat that was released in Minnesota about 10 years ago. It is still grown in several northern-tier states. Polk is a stiff-strawed, bearded wheat that grows to about the same height as Gasser, but matures about 7 days later. In 1981, this variety performed poorly at both test sites. Testing of Polk will not be continued in 1982.

*RUSO* originated in Finland. It is the tallest-growing variety tested during the past 4 years, averaging 4 to 6" taller than Gasser. In spite of its height, it is very stiff strawed and will not lodge. When ripe, the straw and chaf turn dark brown. Ruso has very short beards, varying from 1/8 to 1/2" in length. Ruso is a very high yielding variety but matures about 12 days later than Gasser. During 1978 and 1979, Ruso produced the highest yield in 3 out of 4 tests conducted. In 1980, Ruso was the third highest yielding variety at both test sites. For 1981, Ruso was the highest-yielding variety at Fairbanks and was fourth highest at Delta Junction. This variety continues to ripen evenly and uniformly under cool-wet conditions. Because of its late maturity, Ruso must be planted early (before May 10) in order to ensure successful production. Seed for Ruso is not available to farmers.

Table 11 provides a cumulative list of wheat varieties and experimental lines tested at Fairbanks and Delta Junctuion during the 11-year period from 1971-1981. It also gives the number of years of testing for each variety at these locations. The list does not include durum wheats or winter wheats.

**Table 11. Wheat Varieties Tested at Fairbanks and Delta Junction, 1971-1981.**

| Variety or Experimental Line | Years of Testing | | Variety or Experimental Line | Years of Testing | |
|---|---|---|---|---|---|
| | Fairbanks | Delta Junction | | Fairbanks | Delta Junction |
| Anza | 1 | 0 | Norana | 1 | 1 |
| Butte | 1 | 1 | Opal | 1 | 0 |
| Canthatch | 6 | 4 | Pac. Triple Dwarf | 1 | 0 |
| Capa | 1 | 0 | Park | 11 | 11 |
| Carpo | 1 | 0 | Peak 72 | 0 | 1 |
| Colano | 2 | 1 | Pitic 62 | 7 | 5 |
| Crim | 2 | 0 | Polk | 1 | 1 |
| Dundas | 2 | 2 | Rovaniemi Sel. 70-W | | |
| ECM 316 | 1 | 0 | (Chena) | 9 | 9 |
| Fletcher | 1 | 0 | Ruso | 8 | 6 |
| Fortuna | 1 | 0 | Saunders | 7 | 6 |
| Garnet | 1 | 0 | Selkrik | 2 | 1 |
| Gasser | 11 | 11 | Sheridan | 2 | 0 |
| Glenlea | 0 | 1 | Siberian Bearded | 3 | 2 |
| Idaed | 1 | 0 | Siberian Beardless | 3 | 2 |
| Kharkov (spr.) | 2 | 1 | Sinton | 2 | 2 |
| Kitt | 1 | 0 | Sonora 64 | 1 | 0 |
| Lemhi 66 | 1 | 0 | Springfield | 0 | 1 |
| Manitou | 4 | 2 | Thatcher | 7 | 6 |
| Mexipak | 2 | 1 | Thatcher (insens.) | 1 | 0 |
| MN 7083 | 1 | 0 | Vernon | 2 | 2 |
| MN 70113 | 1 | 0 | WS 1502 | 1 | 0 |
| MT 676 (Isoline) | 1 | 0 | 6WA 637 | 3 | 2 |
| MT 671 (Isoline) | 1 | 0 | 6WA 666 | 1 | 0 |
| MT 677 (Isoline) | 1 | 0 | 6WA 675 | 1 | 0 |
| MT 6711 (Isoline) | 1 | 1 | 6WA 679 | 1 | 0 |
| MT 6717 (Isoline) | 1 | 0 | 6WA 688 | 1 | 0 |
| MT 6721 (Isoline) | 1 | 0 | 6WA 693 | 1 | 0 |
| MT 6722 (Isoline) | 1 | 0 | 6WA 699 | 2 | 1 |
| MT 6723 (Isoline) | 1 | 0 | 6WA 701 | 1 | 0 |
| MT 6725 (Isoline) | 1 | 0 | 6WA 725 | 1 | 0 |
| MT 6727 (Isoline) | 1 | 0 | 6WA 735 | 2 | 1 |
| MT 6728 (Isoline) | 4 | 4 | 6WA 746 | 5 | 3 |
| Napayo | 0 | 1 | 6WA 748 | 1 | 0 |
| Neepawa | 2 | 3 | 61 II-55-12-62-10 (Ingal) | 5 | 5 |
| Nogal | 1 | 1 | 5560 II-53-1-45-2 | 4 | 4 |

## PLANT DISEASE SURVEY

A plant-disease survey was conducted during the 1981 growing season. Observations were made periodically to determine types and rates of plant diseases infecting grain crops in the Delta-Clearwater area and at the Agricultural Experiment Station Experiment Farm at the University of Alaska at Fairbanks. Diseases of barley, oat, triticale, wheat, rapeseed, and sunflower were observed in the experimental plots and in farmers' fields. Evaluations of diseases of barley crops were also made at farms around the Fairbanks and Salcha area.

Barley diseases such as scald (*Rhynchosporium secalis*), stripe (*Helminthosporium gramineum*), net blotch (*Helminthosporium teres*), spot blotch (*Helminthosporium sativum*), loose smut (*Ustilago nuda*), and speckled leaf blotch (*Septoria avenae f.* sp. *triticea*) were found both in the Fairbanks and Delta areas. Barley yellow dwarf virus disease was found only in Fairbanks in 1981. In Delta, scald was the most prevalent disease; barley stripe was also common. In Fairbanks, although barley scald was not a serious disease problem in the Experiment Farm, it was found to be very prevalent in farmers' fields.

A wide range of resistance to various diseases has been observed in the barley variety performance trials conducted at the Experiment Farm in Fairbanks and the Fett Farm in Delta. Table 12 presents a list of diseases observed on barley varieties grown in experimental plots. It also provides an estimate of the degree of disease manifestation (percentage of plants showing symptoms of diseases).

**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** |
|---|---|---|
| Advance | trace | scald, net blotch, spot blotch |
| Bedford | + | scald, spot blotch, net blotch, speckled leaf blotch |
| Datal | +++++ | scald, net blotch |
| Fairfield | + | scald, net blotch, stripe |
| Galt | ++ | scald, net blotch, stripe, spot blotch, speckled leaf blotch, loose smut |
| Hankkija's Eero | ++++ | scald, net blotch, spot blotch |
| Johnston | ++ | scald, net blotch |
| Lidal | ++++ | scald, net blotch, stripe, spot blotch, loose smut |
| Lud | ++ | scald, net blotch, spot blotch |
| Massey | trace | scald, spot blotch, net blotch |
| Melvin | ++ | scald, net blotch, spot blotch |
| Mingo | ++ | scald, net blotch, spot blotch |
| Onda | + | net blotch, scald, spot blotch |
| Otal | +++ | scald, net blotch, speckled leaf blotch |
| Otra | +++ | scald, net blotch, spot blotch |
| Paavo | +++ | scald, net blotch |
| Polaris | ++++ | scald, net blotch |
| Summit | +++ | scald, net blotch, scab |
| Triumph | + | scald, net blotch, spot blotch |
| Weal | +++ | scald, net blotch |
| Windsor | ++ | scald, net blotch, speckled leaf blotch |

*+++++: near 100% of plants show symptoms of diseases; ++++ - 80%; +++ - 60%; ++ - 40%; + - 20%; trace = less than 10%.

**Listed in order of frequency of observance.

Barley stripe is spread mainly by contaminated seeds. In those fields where certified seed or seed treated with fungicides was used, the incidence of barley stripe was low. However, in the fields where farmers used seed produced from the land without proper treatment, the number of stripe-infected plants increased significantly. Net blotch, spot blotch, and speckled leaf blotch (all diseases caused by contaminated seed) also increased significantly. Treating barley seed with systemic fungicide such as Vitavax has produced beneficial effects (Table 13). Although Vitavax did not eradicate stripe fungus from the treated seed, it did provide a certain degree of control, and fewer stripe-infected plants were found in the plots where treated seed was planted. Vitavax, as well as several systemic fungicides still under investigation, also seemed to provide the barley seedlings some protection against scald and other diseases after germination.

In the variety trials, the yields of 15 of 19 varieties were increased by treating seed with Vitavax. Among the remaining four varieties, Windsor was not affected by treatment, and the varieties Massey, Triumph, and Summit all showed a decline in yield of various degrees with seed treatment. The yield reduction in these varieties may be due to a toxic effect produced by fungicide on plants (phytotoxicity).

Quality of grain (test weight and thousand-seed weight) was not noticeably affected by treating seed with Vitavax.

**Table 13. Vitavax Seed Treatment and Its Effects on the Yield of Barley Varieties.**

| | Untreated Seed | | Treated Seed | |
|---|---|---|---|---|
| Variety | Yield (bu/acre) | Test Wt. (lbs/bu) | Yield (bu/acre) | Test Wt. (lbs/bu) |
| Advance | 44 | 33 | 65 | 34 |
| Bedford | 64 | 40 | 79 | 41 |
| Datal | 56 | 46 | 78 | 48 |
| Eero | 84 | 47 | 98 | 46 |
| Fairfield | 61 | 41 | 66 | 47 |
| Galt | 70 | 45 | 76 | 42 |
| Johnston | 52 | 41 | 83 | 42 |
| Lidal | 60 | 44 | 77 | 46 |
| Lud | 56 | 41 | 58 | 40 |
| Massey | 50 | 35 | 46 | 36 |
| Melvin | 67 | 41 | 99 | 43 |
| Otal | 84 | 42 | 87 | 50 |
| Otra | 75 | 47 | 80 | 48 |
| Paavo | 65 | 43 | 80 | 45 |
| Polaris | 83 | 46 | 85 | 47 |
| Summit | 76 | 51 | 62 | 43 |
| Triumph | 52 | 39 | 48 | 38 |
| Weal | 49 | 42 | 55 | 41 |
| Windsor | 76 | 43 | 76 | 38 |
| Average | 64 | 42 | 74 | 43 |

The overall weather condition of the 1981 growing season was cool and humid, which is the condition most favorable for the development and dissemination of scald fungus. Barley scald spread rapidly in the field and resulted in heavy infection in many fields in both the Delta and

Fairbanks areas. In our loss-assessment studies conducted this year, yield losses caused by barley-scald disease were found to be substantial; a 60% yield reduction was found in some fields where barley crops were heavily infected by this disease. Net blotch, a disease also preferring cool and wet weather conditions, was common in all barley fields this year.

Loose smut was found on Galt and Lidal varieties of barley. Yield loss caused by this disease has not been significant. Covered smut was not found.

Ergot (*Claviceps purpurea*) was found on Thural variety this year. The numbers of ergot-infected barley plants remained to be small. However, ergot was found to be a severe disease problem on varieties of triticale. Ergot sclerotia (a hard fungal mass) contain compounds harmful to the circulatory system system of humans and animals, and grain marketed through the Federal grading system of the United States is designated "ergoty" when it contains more than 0.3 per cent ergot sclerotia by weight.

Scab, a disease caused by *Fusarium graminearum* was found on barley in Fairbanks for the first time this year. This disease can be readily recognized by the pinkish-red mycelium mass on the head of barley produced by this fungus. Although there were few scab-infected plants, this disease is potentially quite serious. It not only affects grain by reducing yields, but it also produces a toxin in the grain which can be harmful when eaten by animals (especially swine) and humans.

Two snow-mold fungi – *Sclerotinia borealis* and a sclerotial Low-Temperature *Basidiomycetes* (sLTB) – were found to be very destructive to winter-wheat crops at the Experiment Farm in Fairbanks. The symptoms caused by these two fungi on winter wheat are similar: after snow melted, the infected plants were yellow in color. These plants then gradually wilted and died.

On oat, leaf blotch (*Scolecotrichum graminis*) and Alternaria blotch (*Alternaria* spp.) were also found this year. Yield loss due to these diseases seemed minimal.

On rapeseed, grey leaf spot (*Alternaria brassicae*) was found again this year. The disease in Delta became very serious at the end of the season after a prolonged period of cool, wet weather. Dark spots caused by this disease have been observed on leaves, stems, and seed pods of rapeseed plants. This disease is spread by contaminated seeds.

A grey mold (*Botrytis cinerea*) was found on the head of sunflowers at the Experiment Farm at Fairbanks. This disease was found on most varieties, but was most severe on late-maturing varieties.

Bacteria mosaic (*Corynebacteria tessellaria*) a new disease found in 1980, was observed again this year on spring wheat in the experiment farms at Fairbanks and Palmer. Results of our experiments indicated that this disease can be spread by contaminated seeds. The economic significance of this disease is still unknown.

Barley yellow dwarf (BYDV) was the only viral disease found in the Tanana River Valley in 1981. Plants infected with BYDV produced no grain. This disease is spread by aphids. Heavy infestation of aphids was found in 1981 in barley crops on the Experiment Farm in Fairbanks. As yet no marked spread of BYDV has been observed. Few field plants were infected with this disease, and yield loss was minimal.

## Diseases Observed on Crops During the 1981 Growing Season

Bacteria mosaic of spring wheat (*Corynebacteria tessellaria,* Alaska strain)

A large number of small lesions (spots) on leaves and sheath of the wheat plant is the first indication of bacteria mosiac disease. The color of these lesions varies from beige to orange depending on the susceptibility of the spring wheat variety to this disease. As the disease progresses, these lesions grow together and form long brown-colored 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, nake 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 scald (*Thynchosporium secalis*)

The first symptom on the leaf blades and sheaths is the appearance of oval or diamond-shaped, water-soaked blotches. The color of these scald-like blotches changes from a bluish-green to brown and finally to a bleached straw color with brown margins. Sometimes the spots have a ringed appearance.

Barley speckled leaf blotch (*Septoria avenae f.* sp. *triticea*)

Leaf blotch appears first as light green-to-yellow spots between the veins of the leaves. The lesions spread rapidly to form light-brown irregular blotches with a speckled appearance as the very small, dark-brown fruiting bodies develop.

Barley spot blotch (*Helminthosporium sativum*)

The leaf spot varies in size and shape. Individual spots are found or oblong with well-defined margins. Their color is uniform 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.

Barley yellow dwarf virus disease

The leaves of plants infected with barley yellow dwarf show striking yellowish green blotches. When infection occurs at an early stage of plant development, barley plants develop excessive amounts of tillers and are extremely stunted. Root development of these plants is very poor and limited, and no spikes may emerge. This disease can be transmitted by eleven species of aphids.

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 are very conspicuous.

The ergot sclerotia contain several chemical compounds, most of which are harmful to man and animals.

Grey leaf spot of rapeseed (*Alternaria brassicae*)

Development of round or oval chlorotic spots on the leaves of seedlings is the first sign of the disease. As the disease progresses, elongated blotches appear on the stem and branches of the rapeseed plant. These blotches are ususally bleached straw in color with a dark border. When the relative humidity is high, these blotches frequently turn black. Black spots also appear on seed pods.

Scab (*Fusarium graminearum*)

This disease can be recognized readily by the pinkish-red mycelium mass produced by this fungus on the barley heads. It not only can reduce yields, but 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*)

The symptoms caused by these two fungi on winter wheat are similar: after the snow melts, the infected plants are yellow in color. These plants eventually wither and die.

Grey mold (*Botrytis cinerea*)

This disease attacks leaves, stems, and flower parts of most varieties of sunflower. The first symptom of this disease is the appearance of large water-soaked blotches on plant tissues. As the disease progresses, these blotches turn dark brown. Whitish-grey fungal masses (mycelium) and massive, dark-grey spores found on these patches at the later stages of grey-mold infection is a good indication of this disease.