PERFORMANCE OF CEREAL CROPS IN THE TANANA VALLEY OF ALASKA 1981

F.J. Wooding
Associate Professor of Agronomy

J.H. McBeath
Assistant Professor of Plant Pathology

J.T. Hanscom
Agronomy Research Aide

R.M. Van Veldhuizen
Agronomy Research Aide

Agricultural Experiment Station
School of Agriculture and Land Resources Management
University of Alaska
James V. Drew, Director

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INTRODUCTION

This is the second publication in this format on grain performance trials in the Tanana River Valley. The first, published a year ago, included the results of spring cereal variety tests conducted at Fairbanks and Delta Junction during the 1978 and 1979 growing seasons. Because pof the rapid increase of farmland acreage in Alaska's interior, we decided to make this an annual report. Included in this report are a weather summary, the 1981 variety–test results, and a plant–disease section.

At present, the variety–testing program is limited to thes sites at Fairbanks and Delta Junction. At some time in the near future, it is anticipated that the program will be expanded to include test sites in the vicinity of Salcha, Two Rivers, and Nenana. These areas where development of new lands is currently taking place, or will be in the coming years. The three additional locations would provide a representative cross section of the Tanana Valley's agicultural lands, as well as much–needed information for farmers in these developing areas.

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 1980 growing season for Delta Junction and Fairbanks are summarized in Tables 1 and 2. Weather data for the 1979 growing season are included for camparison with 1980 because of the noticable differences between the two years. 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 two growing seasons. The Delta Junction weather station is located in Delta Junction approximately 10 and 15 miles from the two test sites in the area, 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 1979 and 1980 Growing Season.

	May		June		July		August		September	
	1980	1979	1980	1979	1980	1979	1980	1979	1980	1979
Temp. (°F)										
daily max.	61.9	62.5 (57.1)*	66.6	65.4 (67.1)	70.9	70.5 (69.1)	65.3	68.9 (64.0)	51.4	57.9 (51.8)
daily min.	43.2	40.0 (36.9)	48.4	47.8 (47.1)	52.2	52.0 (50.1)	46.4	52.1 (45.6)	34.9	38.7 (35.3)
daily mean	52.6	51.3 (47.0)	57.7	56.6 (57.1)	61.6	61.3 (59.6)	55.8	60.5 (54.8)	43.2	48.3 (43.6)
Precip. (in.)	0.80	0.10 (0.86)	1.98	2.97 (2.26)	1.32	3.55 (2.68)	2.44	2.08 (2.00)	0.86	0.51 (1.24)

*Values in parentheses represent a 24–year average.

Table 2. Climatic Data for Fairbanks during the 1979 and 1980 Growing Season.

	May		June		July		August		September	
	1980	1979	1980	1979	1980	1979	1980	1979	1980	1979
Temp. (°F)										
daily max.	65.2	66.8 (60.2)*	69.1	69.3 (71.7)	72.9	73.4 (72.7)	65.6	73.7 (67.3)	52.4	60.6 (55.4)
daily min.	35.6	33.9 (33.6)	44.1	44.7 (44.1)	47.9	47.4 (46.8)	40.4	47.1 (43.0)	29.6	32.3 (33.6)
daily mean	50.4	50.4 (46.9)	56.6	57.0 (57.9)	60.4	60.4 (59.8)	53.0	60.4 (55.2)	41.0	46.5 (44.5)
Precip. (in.)	0.11	0.35 (0.80)	2.26	0.81 (1.48)	3.35	2.36 (2.10)	2.00	1.45 (2.44)	0.93	0.21 (1.36)

*Values in parentheses represent a 34–year average.

The 1980 Growing Season

Total precipitation for the 1980 growing season, May through September, was below normal at the Delta Junction recording station. Overall, this station had a 1.64" deficit in rainfall which amounted to about 18% of its 9.04" seasonal average. During the five-month period, only August received above-normal rainfall. The most damaging aspect of the rainfall pattern for Delta Junction occurred during the month of July. Precipitation for July was only half of normal. It is during this month that most grains flower, pollinate, and fill. Moisture stress during this critical growth period probably was a

major factor contributing to the low test weights recorded by many farmers in the 1980 harvest.

Lower–than–normal rainfall during May and June could also have been a factor affecting grain quality. Moisture stress at this time caused uneven seed germination and failure of some spring–applied fertilizer, particularly phosphorus, to dissolve and thus become available for plant growth. When these nutrients finally became available as a result of rainfall later in the season, some fields of grain had substantial amounts of secondary growth and late tillering. These conditions caused uneven ripening and delayed harvest.

August and September might be described as cool and wet by Delta farmers waiting for an opportunity to harvest their grain. This is true if they were comparing climatic conditions with those which occurred the previous year. Although the total amount of recorded precipitation did not vary greatly from the norm for this period, the number of days (frequency) where at least a trace of precipitation was recorded was much greater than normal. For Delta Junction, a trace or more of precipitation was recorded on 35 days of the 61–day, August–September period. Also, during this time, there was no period of several days that was totally free of precipitation. These conditions slowed the ripening process of grains and made field drying difficult.

Overall, temperatures for the 1980 growing season at Delta Junction did not vary greatly from long–term averages. If anything, they were warmer. Monthly mean temperatures were above average for every month except September. However, there were some damaging abnormalities which occurred during the latter part of the growing season. For some low lying areas, the first killing frost (to sensitive plants) occurred on July 31, nearly 3 weeks earlier than normal. This may have had an adverse effect on grain quality in late–planted fields or in fields where seed germination was delayed for lack of moisture. Also, during the first week of September, the area received colder–than–normal temperatures plus an early snowfall. However, after this initial forewarning of an early winter, temperatures warmed and conditions were near normal.

The Fairbanks station received near normal total precipitation for the 1980 growing season. For the period May through September, Fairbanks received 8.65" as compared to 8.18" for the long–term average. Above–normal rainfall was recorded in June and July but deficits occurred during the months of May, August, and September. A very dry, May delayed seed germination and early growth for some crops and resulted in later maturity dates during the fall.

Overall, the Fairbanks growing season was one of the coolest on record. Mean temperatures were well below normal for the months of June, August, and September. Like Delta Junction, Fairbanks was subjected to cold temperatures and snow during the first week of September. Fairbanks did, however, escape the July 31st frost which caused crop damage in some areas near Delta Junction.

The 1979 Growing Season

Although there was considerable deviation from the norm for individual months, total precipitation for the growing season at Delta junction was nearly normal. For May through September, Delta Junction received a total of 9.21" compared to 9.04" for the long–term average. Precipitation for the month of May was almost nil but rainfall during the prime-growth months of June and July was above normal. Crops planted where surface soil–moisture supplies were sufficient for seed germination and early growth produced exceptional yields. The early–season drought caused deeper rooting of seedlings, enabling the plants to draw upon a more extensive supply of soil nutrients when the midseason rainfall was ample.

Fairbanks experienced a 3" deficit in precipitation for the 1979 growing season. Rainfall was well below average for all months except July. For May through September, Fairbanks received a total of 5.18" as compared to 8.18" for the norm.

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At both recording stations, growing-season temperatures were above average for May, July, August, and September. Daily maximum temperatures for June, the only cool month, averaged about 20°F below normal. The unseasonably warm temperatures experienced in August and September, together with below–normal rainfall, produced highly favorable conditions for ripening and harvesting of crops. These conditions were particularly favorable for late-maturing crop varieties and for late–planted crops which, under normal conditions, would not fully mature and would fail to dry out in the field.

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.

	Grain Yield (bu/acre)			
Location	Galt	Otra	Lidal	Weal
Fairbanks				
Average Yield	91	76	66	76
Range of Yields	59–127	50–99	46–91	43–125
Delta Junction				
Average Yield	69	80	61	61
Range of Yields	30–101	48–123	27–92	31–83
Fairbanks and Delta junction				
Average Yield	80	78	64	68
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, 1980—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 $_2$0. The plots were planted on May 6.

Delta Junction, Lee Fett's Farm, 1980—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_20_5 , and 40 lbs/acre K_20 from urea and 10–20–20 fertilizer materials. The plots were planted on May 14.

Table 4. Barley Variety Trials Conducted at Fairbanks and Delta Junction during the 1980 Growing Season.

	Fairbanks[a] University Farm		Delta Junction[a] Lee Fett's Farm	
Variety or Experimental Line	Yield bu/acre	Test Wt. lbs/bu	Yield bu/acre	Test Wt. lbs/bu
BT 334	129	48	61	44
Centennial	83	49	77	48
Fairfield	75	53	79	50
Galt[b]	127	48	75	46
Hankkija's Eero	82	49	86	46
Klondike	72	48	66	45
Lidal[b]	85	49	81	43
Lud	106	54	80	50
Melvin	140	46	81	46
NRGB 79–2	94	41	69	39
Otra[b]	99	49	79	42
Pam	98	48	83	44
Polaris	101	48	70	43
Shabet	90	47	94	45
Strom	81	48	64	45
Summit	97	53	91	50
Triumph	84	52	87	47
Weal[b]	125	44	83	37
Windsor	110	47	79	42
Average	99	48	78	45

[a]Summer-fallowed land.

[b]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.

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 at Palmer, Alaska.

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 ben 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

BT 334 is an experimental line of 6-rowed barley that has shown some scald resistance in tests conducted at Beaverlodge, Alberta. In 1980, BT 334 produced a slightly higher yield than Gait at Fairbanks, but was noticeably lower at Delta Junction. It matured about 2 days later than Galt.

Centennial is a 2–rowed malting barley from the University of Alberta. It is a short, stiff–strawed variety that matures about 3 days later than Galt. During two years of Tanana Valley testing, Centennial has had test weights equal to or greater than the standard (48 pounds per bushel). Like Fairfield, yields have been mediocre. In order to be sure of maturity Centennial must be planted at least 3 days earlier than the cut-off date for Gait. Seed for Centennial should be available from suppliers in the Peace River Region of Alberta.

Fairfield is a 2–rowed, malting barley developed at Lethbridge, Alberta from a cross between Firlbecks III and Betzes. During 2 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 high bushel weights, but yields have 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 variety from Finland that has been included as an entry in the Tanana Valley testing program for the past 3 years. Its performance was very impressive during the first 2 years of testing. In 1979, it produced the highest yield in both the fallow-land and stubble–land trials. In 1980, Hankkija's Eero was the third highest–yielding variety at Delta junction but ranked 16th out of 19 entries in the test conducted at Fairbanks. 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 this variety was destroyed by Sandhill cranes in 1980. Another increase will be attempted in 1981.

Klondike is a 6–rowed, feed barley developed at Brandon, Manitoba. It has good resistance to shattering and lodging, but matures about 2 days later than Gait. Klondike has been a poor yielder during 2 years of testing in the Tanana Valley. In 1980, Klondike was one of the lowest yielding varieties at both the Fairbanks and Delta Junction test sites. Testing of this variety will not be continued in 1981.

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–maruring 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. Farmers who wish to try Lud should plant it no later than May 14 and only on small acreage.

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. Melvin has 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.

NRGB–79–2 is an experimental line of 6–rowed, feed barley from Beaverlodge, Alberta. It matures about the same time as Galt and shows some resistance to scald disease. In 1980, NRGB–79–2 produced lower yields than Galt at both Tanana Valley test sites. It is a rough–awned type that is very difficult to thresh.

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 and 1980. 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 this variety was destroyed by Sandhill cranes in 1980. Another increase will be attempted in 1981.

Polaris is a Canadian, 6–rowed, feed barley developed at Beaverlodge, Alberta, from a cross between

Table 5. Barley Varieties Tested at Fairbanks and Delta Junction, 1971–1980.

Variety or Experimental Line	Years of Testing		Variety or Experimental Line	Years of Testing	
	Fairbanks	Delta Junction		Fairbanks	Delta Junction
Amy	1	1	NRGB–79–2	1	1
Balder	3	2	Olli	6	5
Beacon	1	1	Otis	2	0
Belle	1	1	Otra	6	8
Betzes	6	5	Paavo	2	3
Bonanza	3	3	Palliser	4	2
Bonus	2	3	Para	2	0
Brock	2	0	Parkland	2	0
Br 6505–5	2	0	Piroline	3	2
Br 6505–21	2	0	Polaris	1	1
Br 6505–31–1	2	0	Prilar	1	0
BT 334	1	1	Primus II	2	1
Carlsberg II	1	1	Rovaniemi Sel. 70–B		
Cathy	1	1	(Finnaska)	6	5
Centennial	1	2	Shabet	5	6
Conquest	2	0	Stanka	3	1
Cree	1	1	Steptoe	3	3
Dickson	1	0	Strom	1	1
Dolores	1	1	Summit	1	2
Early Carlsberg II	1	1	Tibet Hulless	3	1
Early Freja	1	1	Trebi	1	0
Early Hannchen	1	1	Triumph	1	1
Edda	7	6	Trophy	1	0
Erbet	3	3	Unitan	1	0
Ershabet	2	2	Vale 70	1	1
Fairfield	1	2	Weal	9	9
Fergus	2	0	Windsor	1	2
Firlbecks III	2	1	62 II–62–2–378411	3	3
Freja	1	1	66 II–62–1–209–204	1	1
Frontier	1	0	66 II–62–2–174–191	3	3
Galt	9	9	66 II–62–3–9–9	2	2
Gateway 63	4	4	66 II–62–3–12–12	1	1
Hankkija 673	1	2	67–38	1	1
Hankkija's Eero	2	3	67–488–999	3	3
Hannchen	1	1	67–942–241	2	2
Herta	1	0	68-3	1	1
Hiland	1	0	70–1591–14–11	1	0
Hyproly	1	0	71–584–58	1	0
Hyproly Normal	1	0	71–991–63	1	0
Jubilee	4	4	71 II–67–18–1	1	0
Karl	I	1	71 II–67–18–57	2	2
Klondike	1	2	71 II–67–19–91	1	0
Larker	1	1	71 II–67–21–111	1	0
Lidal	9	9	71 II–67–22–5	2	2
Lot EX 1–N	1	1	71 II–67–22–6	1	0
Lud	1	1	71 II–67–22–18	1	0
Mari	2	2	71 II–67–22–125	1	0
Melvin	1	2	71 II–67–22–149	1	0
Moravian III	1	1	74 Ab 4302	1	1

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 was tested for the first time in the Tanana Valley in 1980. It required about the same length of time to mature as Galt but ripened more uniformly than Galt. At both test sites, Polaris was outyielded by Galt. The Canadians are currently preparing to license Polaris.

Shabet is a 2–rowed, malting barley developed at Montana State University. Shabet was derived from Betzes, widely grown in Canada and the Rocky Mountain States. Shabet has shown fair adaptation to the Tanana Valley and, when grown under certain conditions, has out–yielded the best of the 6–rowed barleys. Shabet is fairly late, maturing 2 to 3 days after Galt. Shabet performs best when planted early, preferably before May 15.

Strom is an unlicensed, Canadian, 6–rowed barley that is the result of a single plant selection from the variety Olli. It is bearded, early maturing, and has long heads. It appears to have some tolerance to acid soils. Strom was tested for the first time in the Tanana Valley in 1980. At both Fairbanks and Delta Junction, grain yields were low and lodging was severe. Strom is currently under extensive testing throughout Alberta.

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 2 years of Tanana Valley testing, Summit has produced high yields and high test weights. In 1980, Summit was the highest–yielding variety at the Delta junction test site. 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 2 years it has produced exceptionally high yields in tests conducted in England and Scotland. Triumph is a late maturing variety. In 1980, it matured 14 days later than Otra and 5 days later than Galt. It was the second highest yielding variety at Delta Junction but ranked 14th out of the 19 varieties tested at Fairbanks. Seed for Triumph is not available in the U.S. or Canada.

Windsor is a 6–rowed, feed barley developed by the University of Alberta. Windsor is late, maturing 3 to 5 days later than Galt. It has good resistance to shattering but is susceptible to some lodging. Windsor has resistance to scald disease. During 2 years of evaluation, Windsor has outperformed Galt in 2 out of 4 tests. Farmers who want to try this variety for the first time should exercise caution. Windsor should be planted early, preferably before mid–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 10–year period from 1971 to 1980. It also gives the number of years of testing for each variety at these locations.

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 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 oat 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, 1971–1980.

	Grain Yield (bu/acre)			
Location	Nip	Pendek	Rodney	Toral
Fairbanks				
Average Yield	120	118	135	130
Range of Yields	52–159	50–167	63–178	67–179
Delta Junction				
Average Yield	100	115	100	118
Range of Yields	45–145	53–208	51–170	52–179
Fairbanks and Delta Junction				
Average Yield	110	116	117	124
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 1980 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 post–emergence application of Brominal. The following is a brief description of the test sites.

Fairbanks, University Farm, 1980–Fallow Land

The test was conducted on a Tanana silt loam soil (pH 7.2) which had been cleared and in production

Table 7. Oat Variety Trials Conducted at Fairbanks and Delta Junction during the 1980 Growing Season.

Variety or Experimental Line	Fairbanks[a] University Farm Yield bu/acre	Fairbanks[a] University Farm Test Wt. lbs/bu	Delta Junction[b] Lee Fett's Farm Yield bu/acre	Delta Junction[b] Lee Fett's Farm Test Wt. lbs/bu
Athabasca	149	37	121	39
Cavell	191	39	121	39
Foothill	166	38	131	39
Grizzly	146	38	113	38
Hudson	143	37	111	37
Kelsey	140	38	99	37
Laurent	162	39	89	38
Nip[c]	135	39	123	37
Pendek[c]	123	32	142	38
Rodney[c]	178	40	104	39
Sioux	177	39	102	39
Terra	149	37	90	38
Toral[c]	178	41	127	39
Victory	163	41	126	40
Average	157	38	114	38

[a]Summer–fallowed land.
[b]Fall–tilled, wheat–stubble land.
[c]Standard variety.

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_20_5, and 3 0 lbs/acre K_20 from urea and 10–20–20 fertilizer materials. The plots were planted on May 5.

Delta Junction, Lee Fett's Farm, 1980–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 previous year's crop was wheat, and the stubble was tilled under during the fall. Plant nutrients were supplied from urea and 10–20–20 fertilizer materials at a rate of 80 lbs/acre N, 40 lbs/acre P_20_5, and 40 lbs/acre K_20. The plots were planted on May 1.

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 his 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. 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. It is resistant to grain shattering, but some lodging may occur on highly fertile sods. 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 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. 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 1980, Athabasca yielded 14 bushels per acre more than Nip at Fairbanks, but produced 2 bushels per acre less than Nip at Delta Junction. Athabasca is several inches shorter than Nip and has greater resistance to lodging and shattering. Seed for this variety is available from western Canadian sources.

Cavell is a relatively new Canadian variety that has performed well in tests conducted in 1978, 1979, and 1980. In 1980, Cavell was the highest–yielding variety at the Fairbanks test site. It matures about 2 days earlier than Rodney and has good resistance to lodging and grain shattering. Plant height of Cavell averages about 2 inches 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 2 years. In 1979, grain yields were fair and lodging was slight. In the 1980 tests, Foothill was the second highest yielding variety at Delta Junction and ranked fifth at Fairbanks. Seed for Foothill can be obtained from Canadian sources.

Grizzly is a very late–maturing, Canadian variety that can produce high grain yields if growing conditions are favorable. It is weak strawed and is subject to severe lodging. Grizzly produces a heavy yield of straw but, under field conditions, the straw takes longer to dry out than other varieties. Because of late maturity and problems with lodging, testing of Grizzly will not be continued in 1981.

Hudson is a fairly new variety developed in Winnipeg, Manitoba. It is about the same height as Pendek, 4 to 6" shorter than Rodney. It is a stiff–strawed variety and its kernels are creamy white in color. Hudson matures about the same time as Pendek but usually yields less. Because of its short height, Hudson should be considered primarily as a grain oat. Seed for Hudson is available from central and eastern Canadian sources.

Kelsey is a Canadian variety originating in Ontario. It is very similar in appearance to Rodney but has slightly smaller kernels and matures about one day earlier. Kelsey has produced good yields in Tanana Valley tests conducted in 1978 and 1979. However, its performance in 1980 was disappointing, particularly at Delta Junction. This variety is subject to some lodging if high yields are obtained. Seed for Kelsey is available from central and eastern Canadian sources and, possibly, North Dakota.

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. In the 1980 Tanana Valley performance trials, yield of Laurent was good at Fairbanks but poor at Delta Junction. Laurent matured about the same time as Toral and was similar in height. Laurent will be evaluated again in 1981.

Sioux is a Canadian variety developed in Winnipeg, Manitoba. It matures about 1 day earlier than Rodney and is about the same height. Sioux has performed well in Tanana Valley tests during the past 3 years. Its performance on newly cleared land in 1979 was particularly impressive. It has a good test weight and and is resistant to lodging. Seed for Sioux is available from Canadian sources.

Terra is a relatively new, Canadian variety of naked (hulless) oats which has been tested in the Tanana Valley for the past 2 years. Most oat varieties have around 25% hull, so if there were a hull included, the bushels–per–acre yield of Terra would be higher. However, this variety is an improvement over other naked oats tested in the past. Terra may be of a value to bush residents who are involved in subsistence farming. It can readily be ground into flour and used as a good grain.

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. Seed for Victory can still be obtained from Canadian sources.

Table 8 provides a cumulative Est of all the oat varieties and experimental lines tested at Fairbanks and Delta Junction during the 9–year period from 1971–1980. 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, 1971–1980.

Variety or Experimental Line	Years of Testing		Variety or Experimental Line	Years of Testing	
	Fairbanks	Delta Junction		Fairbanks	Delta Junction
Astro	1	1	Nip	10	9
Athabasca	1	2	Orbit	2	2
Cavell	5	4	Pendek	9	9
Cayuse	6	5	Random	6	5
Ceal	6	5	Rapida	1	0
Cherokee	1	0	Rodney	10	9
Chief	1	1	Ravaniemi Sel.		
Cody II	1	0	(Orion)	2	2
Eagle	3	3	Russell	2	1
Foothill	1	2	Sioux	4	3
Frazer	5	5	Spear	1	1
Garry	2	1	Terra	1	2
Gemini	0	1	Toral	10	9
Glen	5	4	Vicland	1	0
Golden Rain	3	2	Victory	4	4
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	1	1	65 X–58–33–2–2	1	1
Markton	1	0			

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, 1971–1980.

Location	Grain Yield (bu/acre)		
	Gasser	Park	Chena
Fairbanks			
Average Yield	51	56	70
Range of Yields	33–69	25–74	46–87
Delta Junction			
Average Yield	34	33	44
Range of Yields	21–47	16–55	27–62
Fairbanks and Delta Junction			
Average Yield	42	44	56
Range of Yield	21–69	16–74	27–87

Table 10. Wheat Variety Trials Conducted at Fairbanks and Delta Junction during the 1980 Growing Season.

Variety or Experimental Line	Fairbanks[a] University Farm Yield bu/acre	Fairbanks[a] University Farm Test Wt. lbs/bu	Delta Junction[b] Lee Fett's Farm Yield bu/acre	Delta Junction[b] Lee Fett's Farm Test Wt. lbs/bu
Chena[c]	87	60	37	58
Dundas	56	61	42	57
Gasser[c]	38	55	32	58
MT 6728	64	60	35	56
Neepawa	58	61	36	61
Park[c]	48	60	29	58
Pitic 62	96	62	33	52
Ruso	70	61	40	58
Vernon	77	62	44	58
Average	66	60	36	57

[a]Summer– fallowed land.
[b]Fall–tilled barley stubble land.
[c]Standard variety.

Table 10 gives the results of wheat variery trials conducted at Fairbanks and Delta Junction during the 1980 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, 1980–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_20_5, and 30 lbs/acre K_20 from urea and 10–20–20 fertilizer materials. The plots were planted on April 29.

Delta Junction, Lee Fett's Farm, 1980–Fall–Tilled Barley Stubble 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 previous year's crop was barley, and the stubble was tilled under during the fall. Plant nutrients were supplied from urea and 10–20–20 fertilizer materials at the rate of 80 lbs/acre N, 40 lbs/acre P_20_5, and 40 lbs/acre K_20. The plots were planted on April 30.

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 a '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 call in height, averaging about 1" taller thin 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 thin Gasser. Chena has a wide range of adaptation, particularly for interior Alaska. Preliminary milling and baking analyses indicates 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 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 bottom–land 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. For 1980, yields of Park were generally low in relation to other varieties. Seed for this variety is available from Canadian seed suppliers.

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. For the 1980 tests, Dundas was the second highest–yielding variety at Delta Junction, but ranked in the lower third at Fairbanks. In these same tests, Vernon was the highest–yielding variety at Delta Junction and third highest at Fairbanks. Both varieties will again be included as entries in the 1981 testing program.

MT–6728 is an experimental line from Montana State University. It is a bearded dwarf line that averages only 22" in height or about 13" shorter than Gasser. It is very stiff–strawed and his shown good resistance to shattering. Because it is late maturing (about 12 days later than Gasser), it performs well only when planted very early (before May 10). Late plantings may not mature or may result in low test weights. Performance of MT–6728 was disappointing in 1980. Yields were lower than in previous years, particularly at Delta Junction. Also, some of the plants reverted back to a taller growth characteristic. Testing of MT–6728 will not be continued in 1981.

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. For 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. Neepawa, will probably replace Park as a standard variety by 1982. Seed for Ncepawa should be widely available from western Canadian seed suppliers.

Pitic 62 is a soft red spring wheat developed by the Mexican Ministry of Agriculture and the Rockefeller Foundation. It is widely adapted and has a very good yield potential. However, it has poor bread–making quality and, when grown under certain conditions, may have a low bushel weight. In the Tanana Valley, Pitic 62 matures 12 to 14 days later than Gasser. For the 1980 performance trials, Pitic 62 was the highest–yielding variety at Fairbanks and second to the lowest–yielding variety at Delta junction. At Delta Junction, a test weight of *52* pounds per bushel was recorded, well below the standard. Because of its late maturity and poor quality, Pitic 62 is not recommended for the Tanana Valley.

Ruso originated in Finland. It is the tallest–growing variety tested during the past 2 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 rum 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. For 1980, Ruso was the third highest–yielding variety at both test sites. 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 it Fairbanks and Delta Junction during the 10–year period from 1971–1980. 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, 1971–1980.

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	Pic. Triple Dwarf	1	0
Capa	1	0	Park	9	9
Carpo	1	0	Peak 72	0	1
Colano	2	1	Pitic 62	7	5
Crim	2	0	Rovaniemi Sel. 70–W		
Dundas	1	1	(Chena)	8	8
ECM 316	1	0	Ruso	7	5
Fletcher	1	0	Saunders	7	6
Fortuna	1	0	Selkirk	2	1
Garnet	1	0	Sheridan	2	0
Gasser	9	9	Siberian Bearded	3	2
Glenlea	0	1	Siberian Beardless	3	2
Idaed	1	0	Sinton	2	2
Kharkov (spr.)	2	1	Sonora 64	1	0
Kitt	1	0	Springfield	0	1
Lemhi 66	1	0	Thatcher	7	6
Manitou	4	2	Thatcher (insens.)	1	0
Mexipik	2	1	Vernon	1	1
MN 7083	1	0	WS 1502	1	0
MN 70113	1	0	6WA 637	3	2
MT 676 (Isoline)	1	0	6WA 666	1	0
MT 671 (Isoline)	1	0	6WA 675	1	0
MT 677 (Isoline)	1	0	6WA 679	1	0
MT 6711 (Isoline)	1	1	6WA 688	1	0
MT 6717 (Isoline)	1	0	6WA 693	1	0
MT 6721 (Isoline)	1	0	6WA 699	2	1
MT 6722 (Isoline)	1	0	6WA 701	1	0
MT 6723 (Isoline)	1	0	6WA 725	1	0
MT 6725 (Isoline)	1	0	6WA 735	2	1
MT 6727 (Isoline)	1	0	6WA 74.6	5	3
MT 6728 (Isoline)	4	4	6WA 748	1	0
Napayo	0	1	61 II–55–12–62–10	4	4
Neepawa	1	2	5560 II–53–1–45–2	4	4

PERFORMANCE OF MISCELLANEOUS GRAIN CROPS: RYE, TRITICALE, AND SPELTZ

This section is reserved for reporting the performance of the less–important grain crops that are not tested on an annual basis, and of new types of grain crops being evaluated in the Tanana Valley for the first time. For the 1980 testing program, rye, triticale, and speltz fit into this category.

Table 12 gives the results of the rye, triticale, and speltz trials conducted at Fairbanks and Delta Junction during the 1980 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 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. The following is a brief description of the test sites.

Fairbanks, University Farm, 1980–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_20_5, and 30 lbs/acre K_20 from urea and 10–20–20 fertilizer materials. The plots were planted on April 30.

Delta Junction, Lee Fett's Farm, 1980–Fall–Tilled Barley Stubble Land

The test was conducted on a Richardson silt loam sod (pH 5.7) which had been cleared and in production for over 20 years. The previous year's crop was barley, and the stubble was tilled under during the fall. Plant nutrients were supplied from urea and 10–20–20 fertilizer materials at the rate of 80 lbs/acre N, 40 lbs/acre P_20_5, and 40 lbs/acre K_20. The plots were planted on May 5.

Table 12. Rye, Triticale, and Speltz Trials Conducted at Fairbanks and Delta Junction during the 1980 Growing Season.

Variety or Experimental Line	Fairbanks[a] University Farm Grain lbs/acre	Yield bu/acre	Delta Junction[b] Lee Fett's Farm Grain lbs/acre	Yield bu/acre
Rye				
Gazelle	4424	79	2856	51
Prolific	1288	23	840	15
Triticale				
HN470	530	c	393	c
Welsh	2981	c	1248	c
6TA 419	2994	c	1786	c
6TA 518	3084	c	1897	c
Speltz	3420	c	2400	c

[a]Summer -fallowed land.
[b]Fall–tilled barley stubble land.
[c]Triticale and speltz do not have a standard bushel weight by which bushels per acre can be measured; see pg. 2.

RYE

Rye (*Secale cereale*) can be grown successfully in some areas of Alaska but has never been an important crop. A major limitation to rye production in Alaska is the susceptibility of this crop to ergot disease (see Plant Disease Survey, pg. 24), which can make the grain unusable for human food or animal feed. Rye is less desirable than other grains for use as an animal feed because of lower digestibility and palatability problems. When used as a feed, rye is usually mixed with other grains. Ryes of both winter and spring growth habits can be grown in Alaska but generally yield less than other grains. The two rye varieties tested in 1980 are spring types and are of Canadian origin.

Gazelle is a relatively new, spring variety developed at the University of Saskatchewan from a single plant selection out of a German strain. During its first year of Tanana Valley testing, Gazelle was superior to Prolific in all aspects. It was much higher yielding, stiffer strawed, and matured 2 to 3 days earlier. Also, yield of Gazelle was comparable to some of the better wheat varieties.

Prolific is an older spring variety that has been evaluated at Fairbanks and Delta Junction during the early and mid–1970s. Prolific is early maturing when compared with other springsown ryes, but is late maturing when compared with most other types of spring sown grains. However, it will usually reach maturity, even under adverse climatic conditions. Performance of Prolific in 1980 was much poorer than in previous years of testing.

TRITICALE

Triticale is a manmade crop resulting from a cross between wheat and rye (*Triticum aesitivum* X *Secale cereale*). Although considerable progress has been made during the last decade, this crop is still in the experimental stages of development. Since 1971, over 100 experimental lines of triticale have been evaluated in the Tanana Valley. Many have produced yields equal to or greater than wheat or barley. However, virtually all of the triticales tested have been late maturing and susceptible to ergot disease (see section on plant diseases).

HN470 was included in the test because it is the earliest–maturing triticale tested in Alaska during the past 10 years. However, it is also the lowest yielding. Performance of HN470 in 1980 was very poor. Seed for this triticale was obtained through the University of Manitoba but it is believed to have originated in Mexico.

Welsh is the newest of the four triticales tested in 1980, and is a named variety. Welsh was released by the University of Manitoba in 1977 and has been reported to yield well in southern Alberta. For 1980, yield of Welsh was fair at Fairbanks and poor at Delta Junction. However, this variety matured 3 to 5 days earlier than many of the triticales previously tested.

6TA419 and 6TA518 are experimental triticales developed by the Jenkin's Foundation for Research in Salinas, California. In previous testing, these triticales have been high yielding but required 10 to 14 days longer to mature than early varieties of wheat. For 1980, 6TA419 and 6TA518 produced the highest yields of the 4 triticales evaluated, but yields were generally lower than in past performance trials.

SPELTZ

Speltz (*Triticum aesitivum*, subspecies *spelta*) is also commonly named 'spelt' and 'spelta.' It is a primitive type of wheat that retains its glumes (husks or hulls) when threshed. In appearance, its kernels more

closely resemble barley than the common types of wheat grown in most areas of the world. Speltz is grown as a food crop in extreme environments such as the high plateau of west central Iran and at high altitudes in the upper Rhine region of central Europe. Speltz is currently of little or no economic importance in the U.S., although small quantities are still grown for use as a livestock feed or simply as a novelty crop.

Seed for the speltz tested in the Tanana Valley during 1980 came from Dakota Seed Service in Aberdeen, South Dakota. Speltz ripened fully at both the Fairbanks and Delta Junction test sites. Although it was later in maturity than some of the earlier wheats, it continued to ripen under cool wet conditions. Respectable yields were produced at both locations. Considering the less–than–favorable growing conditions experienced in 1980, it is safe to assume that speltz can be grown successfully in the Tanana Valley with little risk of failure to mature. The big question is: what to do with it, once it is grown?

PLANT DISEASE SURVEY

During the 1980 growing season, observations were taken periodically to determine types and rates of occurrence of plant disease infecting grain crops in the Delta–Clearwater area and at the Experimental Farm of the University of Alaska at Fairbanks. Diseases on barley, oat, rye, triticale, wheat, rapeseed, and sunflower were observed on the experimental plots and on farmers' fields.

On barley, diseases such as scald *(Rhynchosporium secalis),* stripe *(Helmintbosporium gramineum),* net blotch *(Helminthosporium teres),* spot blotch *(Helmintbosporium sativum)* and yellow dwarf were found both in the Fairbanks and Delta areas. Loose smut *(Ustilago nuda),* covered smut *(Ustilago hordei),* and speckled leaf blotch *(Septoria avanae f. sp. triticea)* were diseases found only in the Delta-Clearwater area. In Delta, scald and stripe (especially scald) were the most predominant diseases. However, in Fairbanks, barley scald was not a very serious disease in the 1980 season. 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 13 presents a list of diseases observed on barley varieties grown in experimental plots. It also gives an estimate of the degree of disease manifestation (percentage of plants showing signs of disease).

Barley stripe is spread mainly by contaminated seeds. In the 1979 season, seeds planted on new lands in the Delta–Clearwater area were certified seeds, and the incidence of barley stripe was low. In the 1980 season, many farmers used seeds produced from the land without proper treatment, and the number of stripe–infected plants as well as net blotch, spot blotch, and speckled leaf blotch increased significantly. Treating barley seeds with a systemic fungicide—Vitavax—has produced beneficial effects (Table 14). Even though Vitavax was not capable of eradicating stripe fungus from the treated seeds, it did provide a certain degree of control and fewer stripe–infected plants were found in the plot where treated seeds were planted. Also, Vitavax seemed to provide the barley seedlings some protection against scald and other diseases after germination. The beneficial effects of Vitavax were manifestated most

Table 13. Summary of Diseases Observed on Barley Varieties under Field Conditions in the Delta–Clearwater Area.

Barley Variety	Degree of Disease Manifestation[a]	Disease Observed[b]
BT 334	+	scald
Centennial	++	scald, net blotch, stripe, spot blotch, loose smut
Fairfield	+++	scald, stripe
Galt	++	scald, spot blotch, loose smut
Hankkija's Eero	++	scald
Klondike	+++	scald, stripe
Lidal	++	scald, net blotch, stripe
Lud	++	scald, net blotch
Melvin	++	scald, spot blotch, covered smut
NRGB–79–2	+	stripe, scald, spot blotch
Otra	+	scald, speckled leaf blotch
Paavo	++	scald, stripe, net blotch, spot blotch
Polaris	++	scald
Shabet	+	scald, stripe, loose smut
Strom	+	scald
Summit	++	scald, net blotch, speckled leaf blotch
Triumph	++++	scald, spot blotch
Weal	+	scald
Windsor	++	scald

[a]++++= 80% of plants show signs of diseases; +++= 60%; ++= 40%; and += 20%.

[b]Listed in order of frequency of observance.

Table 14. Vitavax Seed Treatment and Its Effects on the Yield of Barley Varieties.

Variety or Experimental Line	Untreated Seed Yield bu/acre	Untreated Seed Test Wt. lbs/bu	Treated Seed Yield bu/acre	Treated Seed Test Wt. lbs/bu
BT 334	60	46	61	44
Centennial	56	45	77	48
Fairfield	69	51	79	50
Gait	69	46	75	46
Hankkija's Eero	53	47	86	46
Klondike	66	46	66	45
Lidal	63	42	81	43
Lud	63	48	80	50
Melvin	54	44	81	46
NRGB–79–2	59	40	69	39
Otra	64	42	79	42
Paavo	77	44	83	44
Polaris	58	45	70	43
Shabet	73	44	84	45
Strom	64	46	64	45
Summit	70	48	91	50
Triumph	71	49	87	47
Weal	75	36	83	37
Windsor	65	43	79	42
Average	65	45	78	45

markedly in the highly susceptible varieties such as Lidal, Lud, and Polaris.

Yield of 17 out of the 19 varieties was increased by treating seed with Vitavax. The remaining 2 varieties (Strom and Klondike) showed no difference between treated and untreated seed. The most noticeable varietal difference resulting from seed treatment occurred with Hankkija's Eero, where yield was increased 33 bu/acre. Overall, the average yield of the 19 barley varieties was 20% higher (13 bushels/acre higher) for the treated seed.

78 bu/acre treated
65 bu/acre untreated
13 bu/acre difference
13/65 (100) = 20%

Test weights of grain were not noticeably effected by treating seed with Vitavax.

The abnormally low precipitation in May and June in the Delta area was unfavorable for the development and spread of barley scald, and the rate of occurrence of this disease was low. From mid–July through August, rainfall in Delta–Clearwater area increased. The cool, wet weather greatly favored the development and dissemination of scald fungus, resulting in the rapid spread of this disease (on both new and old lands). At the end of the growing season, heavy scald infection was found in many fields.

Barley yellow dwarf is the only virus disease found in the Tanana River Valley. Plants infected with barley yellow dwarf virus produced no grain. Since the number of plants found in the field to be infected with this disease this year was small, yield loss caused by this disease was minimal.

Loose smut was found on Centennial and Shabet varieties of barley. In one field, where Gait barley was planted, the loose smut infection was found to be as high as 15%. Since loose–smut–infected plants do not produce grain, the yield loss in this field was significant.

Covered smut was found on Melvin barley. Ergot *(Claviceps parpurea)* which was found on some barley varieties in 1979 was not found on barley this year. However, ergot was found to be a severe disease problem on varieties of rye and triticale. Ergot sclerotia contain compounds harmful to the circulatory system of humans and animals, and grain marketed through the Federal grading system of the United States is designated "ergory" when it contains more than 0.3 per cent ergot sclerotia, by

Table 15. Percent of Ergot Sclerotia by Weight Recovered from the Threshed Grain of Rye and Triticale Varieties.

Variety or Experimental Line	Fairbanks University Farm	Delta junction Lee Fett's Farm
Rye		
Gazelle	0.88	0.01
Prolific	4.75	0
Triticale		
HN470	0.85	0
Welsh	0.68	0
6TA419	4.94	0
6TA518	2.63	0

weight. This year, the percentage of ergot by weight recovered from varieties of rye and triticale tested at the experiment farm was above the "ergory" level. (Table 15).

A new disease, caused by a gram–positive, rod–shaped bacteria was found on triticale this year. This disease can be recognized readily by the large number of small chlorotic lesions on the leaves and sheath of the plant. This disease has also been observed on many spring wheat varieties in the experiment farm at Palmer. The economic significance of this disease is still unknown.

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 those late–maturing varieties.

Diseases Observed on Crops during the 1980 Growing Season

Barley covered smut (*Ustilago hordei)*

Covered smut of barley produces dark brown to black spore masses instead of kernels. However, the smut masses are enclosed in a thin, grayish-white membrane which remains intact until harvest. The smutty heads of covered–smut–infested barley emerge at about the same time as those of the healthy plants.

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 *(Rynchosporium secalis)*

The first symptom on the leaf blades and sheaths is the appearance of oval or diamondshaped, 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 round or oblong with well–defined margins. Their color is a 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.

Ergot *(Claviceps purpurea)*

The first symptom of this disease is a sticky exudate which appears in the spikes. A blueblack, 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 usually 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.