# Alternative Grain and Oilseed Crops for Interior Alaska

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## INTRODUCTION

Barley is the principal grain crop in Interior Alaska. Oats are second in importance but are often harvested for hay rather than grain. Due to the short growing season (83–100 frost-free days), options for alternative crops are limited and producers have little opportunity to rotate crops for weed and disease control or to switch crops as prices fluctuate. Wheat, triticale, buckwheat, canola, flax, sunflowers, meadowfoam, faba beans, and field peas have all been grown on a small scale in Alaska. However, little information is available on the climatic, nutrient, or cultural requirements, the probability of a successful harvest, the quality of the harvested product, or the potential markets for these crops. This study was initiated in 1993 to evaluate several niche crops for Interior Alaska.

#### METHODS AND MATERIALS

Alternative crops were tested at three locations in 1993: the UAF Experiment Farm west of Fairbanks; Dan Coben's farm in the Eielson Agricultural Project south of North Pole; and the UAF Experiment Field near mile 1408 Alaska Highway east of Delta Junction. The fields at Delta and Fairbanks had been planted to barley the previous year, and the field at Eielson had been planted to buckwheat. The fields at all locations were fertilized and tilled once with a disk and once with a roterra prior to planting. Fertilizer consisted of ammonium sulfate, urea, monoammonium phosphate, potassium chloride, and sodium borate, blended to provide an equivalent of 16% N, 20% P<sub>2</sub>O<sub>5</sub>, 16% K<sub>2</sub>O, 6% S, and 0.33% B. Rates

of fertilization varied among crops (Table 1). Since fertilization rates were unknown for several of the crops, an assumed high and low rate was compared on each crop. All crops were planted with a cone seeder in rows spaced eight inches apart in plots eight feet by 50 feet. Seeding rates in pounds of pure live seed per acre were: barley 90; oats 95; wheat 90; canola 7; flax 80; sunflower 6; field peas 60; canarygrass 40; and buckwheat 50. Plots were replicated four times in a randomized complete block design at each location. A majority of the crops were planted May 6 at Delta, May 17 at Fairbanks, and May 19 at Eielson. However, late arriving seed of polish canola and field peas were planted at Delta on May 21. The selection of crops and varieties tested in 1993 was limited by the availability of seed. Some seeds arrived too late for planting.

During the growing season, plots were tended weekly at each location and data were collected on percent ground cover, stage of maturity, and biomass accumulation. Biomass was determined by clipping all above ground plant tissue from a 4.4 square foot area along one side of each plot each week. The biomass sample was dried in a forced air dryer at 110°F to determine dry weight. At maturity, a four-foot wide swath was harvested with a plot combine from each plot to determine seed yield.

### **RESULTS AND DISCUSSION**

The Eielson Agricultural Project is relatively close to Fairbanks and its 1993 weather patterns were similar to the Fairbanks Experiment Station, so weather records are shown only for Fairbanks and Delta (Fig. 1). Precipitation was near normal at Fairbanks during May and June, however, during the 54 days from June 28 to August 20, only 0.72 inch of rain fell as compared to a long-term average of 2.26 inches. On August 21, when crops were about ready to harvest, it started to rain and continued for 21 of the next 32 days delaying harvest. At Delta, rainfall remained below normal throughout the growing season. Volunteer barley at both the Fairbanks and Delta sites also provided moisture competition for the alternative crops.

Cumulative heat units, growing degree days (GDD), were recorded in 1993 by calculating the average temperature each day in degrees celsius (°C) and totaling those degrees above freezing (0°C) for the growing season (GDD=total °C above freezing). Temperature was warmer than normal at all locations in 1993. With GDD by August 20 (the approximate date of maturity for most crops) totaling 115 above normal at Fairbanks and 94 above normal at Delta. This equates to crop maturity approximately eight days earlier than normal at Fairbanks and six days earlier than normal at Delta. From only one year's results, the following observations are noteworthy:

**Barley**—Performed well at all locations. *Otal* was the earliest maturing variety. *Eero* yielded highest at two locations. *Thual*, CDC *Buck*, and CDC *Richard*, are all hulless varieties producing naked kernals. The hulless varieties were slightly later in maturity than hulled varieties. The variety CDC *Richard* yielded highest of the hulless varieties at two locations.

**Oats**—*Cascade* yielded highest at all locations. *Freedom* and *Pennuda* are hulless varieties and both were very late in maturing. *Freedom* yielded highest, but of the two *Pennuda* would have a much higher probability of reaching maturity.

**Wheat**—*Ingal* was the earliest variety to mature but shattered badly if not harvested immediately. *Cutler* yielded highest at all locations.

**Argentine canola**—All varieties matured very late. *Westar* yielded highest at two locations.

**Polish canola**—Matured much earlier than Agrentine. *Reward* was the first variety to emerge in

Table 1. Performance of alternative crops at three locations in Interior Alaska in 1993.

					F	airban	ks	Eielson	Delta
					50%	Test		50% Test	50% Test
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<sup>1</sup>Fertilizer rates - (lbs/acre n,  $P_2O_5$ ,  $K_2O$ , S, and B) - 1 = 24-30-23-9-0.5); 2 = (48-60-47-19-1); 3 = (96-120-94-38-2). <sup>2</sup>Cumulative growing degree days to the point that 50% of the plants were fully mature (total average daily temperature °C above freezing). <sup>3</sup>Nogal wheat seed had poor germination and the resulting poor stands were not harvested at Fairbanks and Eielson in 1993. <sup>4</sup>Field peas matured but due to damage from severe lodging and migratory waterfowl feeding data were not collected on two varieties.

spring and yielded the highest at all locations. *Eldorado* was early and set more pods than other varieties, but showed greater drought stress than other varieties.

**Flax**—*Norlin*, the only variety tested, didn't compete well with weeds or volunteer barley.

**Sunflower**—*Sunwheat 103* was the earliest to mature and produced the highest yield. However, it was very slow to dry after maturity and it never dried enough in the field to combine harvest.

**Field peas**—All varieties grew well but they lodged on the ground precluding mechanical harvest. Migratory waterfowl fed on the peas at all locations destroying most of them. *Express peas* showed the most promise, and small areas of that variety were hand harvested for yield estimates.

**Canarygrass**—*Elias* was the only variety tested. It matured early and looked promising. However, the fertilizer rates selected were too low.

**Buckwheat**—*Winsor Royal* was the only variety tested. It was late maturing and many seeds never reached maturity but it showed good yield potential. Migratory waterfowl harvested most of the plots.

Soil fertility was much higher at Fairbanks than on the newly cleared soils at Eielson and Delta. At Fairbanks, crops showed very little—if any—response to fertilization rates. However, at Eielson, yields approximately doubled when doubling the fertilizer applications. At Delta, yields also improved with increased fertilization, however, due to drought conditions, plant response to fertilizers was not as great. Additional studies will be required to identify the nutrient requirements of these alternative crops.

## **FUTURE GOALS**

Additional crops and varieties will be evaluated each year. By determining the GDD requirements of each crop over a period of years and comparing these to historical weather records, we should be able to predict the probability of each crop reaching maturity at each location. Also, the data will enable us to predict the effect of possible global warming on potential crops for Alaska's future. Percent ground cover and biomass accumulation data will be used to determine the value of these crops in reducing soil erosion.

In 1993, sunflowers matured much faster around the perimeter of plots than in the middle of plots. This appeared to be a result of less moisture stress. In 1994, a portion of this study will be irrigated to determine the effects of supplemental water on yield and maturity of the alternative crops.

In some plots, sunflowers and canola will be seeded in mixed stands then swathed and combine harvested together to determine if sunflowers can be dried for an earlier harvest in this manner.

Field peas will also be seeded in mixed stands with other crops to prevent lodging of the peas and facilitate harvesting.

Canarygrass will be fertilized at the same rate as barley in 1994.

### ACKNOWLEDGEMENTS

This study was made possible by a grant from the Alaska Science and Technology Foundation, and by the cooperation of Daniel Coben and Terrance Vraniak, C & V Seed Inc., North Pole, Alaska.



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