University of Idaho
College of Agriculture
Cooperative Extension Service
Agricultural Experiment Station

Current Information Series No. 380
March 1977

Alternative Crops for Northern Idaho

D. L. Auld G. A. Murray E. R. Mink B. W. Studer

Northern Idaho has some of the most productive crop land in the United States. Fertile land and close proximity to Pacific markets has made the production of wheat, barley and peas profitable to area growers. However, in recent years, low market prices and increased production costs have often made these crops unprofitable. The introduction of additional crops which can be sold to different markets could help stabilize the agricultural economy of this area.

In 1976, a program was initiated by the University of Idaho Agricultural Experiment Station to survey potential alternative crops for northern Idaho. The initial trials evaluated crop species for climatic adaptation to this area. Subsequent studies will include varietal testing, crop management practices, pest control and marketing. This report summarizes the results of the initial trials.

Nurseries contained one or two varieties of each crop species. Varieties were obtained from adjoining states and southern Canada on the basis of their possible adaptation to northern Idaho (Table 1). Plants were grown under dryland conditions and plots were hand weeded. Observations were made during the growing season on potential insect and disease pests, maturity and other agronomic characteristics. Crops were harvested as they matured and were thrashed with an experimental plot combine to simulate commercial production. Seeds were cleaned with a clipper cleaner and the quality analyses were determined on a composite sample of each variety from each location.

Bright-flowered safflower (above) and sunflower (back page) are two of the oil crops tested in these trials.

Legume Crops

The legume trials grown at Moscow and Grangeville were seeded on May 10 and May 5, respectively. Immediately after seeding, plots were inoculated with the appropriate commercial inoculum of *Rhizobium*. The trials escaped frosts in early May and received above average moisture in July and August — 2.2 inches and 0.9 inches above normal for Moscow and Grangeville, respectively.

Both varieties of peas were damaged by root rot at Grangeville and had reduced seed yields (Table 2). Several varieties of beans, broad beans and soybeans produced seed yields competitive with the average yield of spring peas. However, broad bean appeared to be susceptible to both the pea leaf weevil and to an *Alternaria* leaf spot. Both varieties of soybeans bloomed in early August and did not complete seed filling until early September. During this period, soybeans would have been extremely susceptible to early fall frosts.

Many of the bean varieties were poorly nodulated at Grangeville, which was reflected in the reduced levels of seed protein (Table 2). Both soybean varieties produced seeds with high levels of protein.

Oil Crops

The oil crop trials grown at Grangeville, Moscow and Bonners Ferry were seeded on May 10, May 5 and May 21, respectively. Some of the Moscow plots were destroyed by rodents and data were taken on unreplicated plots. The mustard seed arrived after May 5 and these entries were grown only at Moscow.

At both Grangeville and Moscow many of the oil crops had seed yields competitive with the areas where they are now grown commercially (Table 3). Safflower, crambe and sunflowers appeared to be well adapted. Spring rape and

flax did not yield well at Grangeville. Spring rape suffered early damage from flea beetles which probably reduced seed yield. Flax should have been seeded at a higher rate.

Mustards, sunflowers and crambe were high yielders at Moscow. The yields of sunflowers are probably inflated because they reflect data taken from unbordered plots. Our seed yield data, supported by historical data collected by Dr. Klages from 1932 to 1953, indicate that both safflower and flax are well adapted to the Palouse.

Some of the oil crops did not produce good seed yields at Bonners Ferry. However, spring rape, sunflowers and one variety of crambe produced excellent seed yields in this area. Both flax and safflower produced low seed yields at Bonners Ferry.

Oil analyses indicated that some crops did not complete seed filling and therefore had reduced levels of seed oil (Table 3). This was especially noticeable at Bonners Ferry where flax, safflowers and the later variety of crambe had reduced levels of seed oil. At both Moscow and Grangeville, the earlier varieties produced higher levels of seed oil indicating the importance of early maturity in oil crops.

Both "Ada" and "Norman" soybeans are grown primarily for high protein rather than high oil. Most varieties of high oil soybeans require a longer growing season than can be expected in northern Idaho. As expected, oil content of both varieties of soybeans was low under our conditions.

The results of the initial trials look promising and further testing will be conducted next spring. Trials with fall seeded crops are currently under progress in northern Idaho. These crops include hard red winter wheat, winter lentils, winter rape and meadow foam. Spring and winter seeded trials will be repeated during the next two years so that yield performance of the crops can be measured over several years.

Once a crop species has been identified as having potential in northern Idaho, research will be initiated to locate high yielding varieties, to develop crop management techniques, to develop weed and insect control measures and to locate potential markets. With an integrated approach, additional crops may be added to the cropping systems of northern Idaho.

Data presented in this publication are based on initial trials and do not constitute a recommendation by either the University of Idaho Agricultural Experiment Station or the authors.

Table 1. The varieties, uses and sources of seed of alternate crop species evaluated in the alternate crop nurseries of 1976.

Crop	Variety	Uses	Source
Oil Crops			
Safflower *(Carthamus tinctorious)*	S-208	Cooking oil Industrial oil Animal feed	Montana State Univ., Eastern Agricultural Research Center, Sidney, MT
Rape *(Brassica* spp.)	Tower, Span	Cooking oil Industrial oil Animal feed	Dept. of Plant Science, Univ. of Manitoba, Winnipeg, Manitoba, Canada
Crambe *(Crambe abyssinica)*	Meyer, Prophet	Plastic production Rubber additives Waxes	Dept. of Agronomic Crop Science, Oregon State Univ., Corvallis, OR
Flax *(Linum usitatissimum)*	Linott, Culbert	Industrial oil Animal feed Paper production	North Dakota State Univ., Langdon Experiment Station, Langdon, ND
Sunflower *Helianthus annus)*	Hybrid 894 Peredovick	Human consumption Cooking oil Animal feed	North Dakota State Univ., U.S.D.A. - A.R.S. Fargo, ND
Mustard *(Brassiea* spp.)	Lethbridge Gisilba	Human consumption Industrial oil	North Dakota State Univ., U.S.D.A. - A.R.S. Fargo, ND
Legumes			
Bean *(Phaseolus vulgaris)*	UI-114, UI-111 UI-36, Pink Viva GN-1140, SW-43	Human consumption	Univ. of Idaho, Agricultural Experiment Research Center, Twin Falls
Broad bean *(Vicia faba)*	Petite	Human consumption Animal feed	Agricultural Experiment Station, Univ. of Minnesota, St. Paul, MN
Soybeans *(Glycine max)*	Norman, Ada	Human consumption Animal feed Cooking oil	Pacific Coast Soybeans, Walla Walla, WA

Table 2. Seed yields and percentages of seed protein of several legume crops tested in 1976 as alternative crops for northern Idaho.

Crop	Variety	Seeding Rate lb/acre	lb/acre		Percent of Seed Protein[2]	
			Moscow	Grangeville	Moscow	Grangeville
Bean	Pinto UI-114	156	2648 a[1]	1838 ab	26.0	22.7
	Pink Viva	128	2530 a	1981 a	25.4	20.2
	Great Northern 1140	156	1994 ab	1893 a	25.2	23.2
	Pinto UI-111	160	1947 ab	—	25.1	—
	Red Mexican UI-36	132	1642 bc	1859 a	27.6	23.3
	Small White 43	92	939 cd	1029 cd	28.5	22.7
Pea	Fenn (spring planted)	125	1956 ab	686 d	23.2	27.0
	Alaska	232	1450 bc	632 d	23.6	25.5
Broad bean	Petite	98	1726 b	1982 a	27.3	25.4
Soybean	Norman	76	1520 bc	1719 ab	33.9	41.3
	Ada	84	1501 be	1730 ab	39.0	41.6
Lentils	Chilean	54	681 d	1349 bc	24.6	24.7

[1] Means within a column not followed by the same letter differ significantly at the .05 level of probability.

[2] Determined by the Technicon-Auto Analyzer Method at the University of Idaho Plant and Soil Analytical Laboratory.

Table 3. Seed yields and percentages of oil in seed samples of oil crops tested in 1976 as potential alternative crops for northern Idaho.

Crop	Variety	Seeding Rate lb/acre	Seed Yield in lb/acre				Percent of Seed Oil[4]			
			Sidney Montana[1]	Moscow[2]	Grangeville	Bonners Ferry	Sidney Montana	Moscow	Grangeville	Bonners Ferry
Safflower			1520				36-40			
	S-208	10		1885	1984 a[3]	645 bc[3]		32.3	36.9	19.3
Rape			390				30-32			
	Tower	8		1350	616 e	2576 a		31.8	38.0	32.3
	Span	5		-	790 de	2315 a		26.8	34.0	33.5
Crambe			1270				28-32			
	Meyer	5		2856	1689 ab	2757 a		32.2	29.8	26.4
	Prophet	5		2908	1401 bc	965 b		27.2	21.4	19.7
Flax			1080				39-44			
	Linott	5		1263	947 d	237 c		37.8	36.7	26.7
	Culbert	5		1806	832 de	165 c		37.4	36.9	30.5
Sunflower			1120				39-42			
	Hybrid 894	10		-	1109 cd	1210 b		-	43.3	38.8
	Peredovick	10		3314	909 de	-		39.0	43.5	-
	N. D. Common	10		-	-	992 b		-	-	38.5
Mustard	Lethbridge	5	820	2073	-	-	33-35	31.0	-	-
	Gisilba	5	680	2355	-	-	23-25	22.1	-	-
Soybean							16-19			
	Ada	-	-	1520 bc[3]	1719 ab	-		14.3	13.8	-
	Norman	-	-	1501 be	1730 ab	-		15.6	14.3	-

[1] Average seed yield data for four years at Montana Eastern Agricultural Research Center, Sidney, MT.

[2] Means of Moscow sites based upon unreplicated observational plots.

[3] Means not followed by the same letters differ significantly at the .05 level of probability.

[4] Determined by the nuclear magnetic resonance method at the Montana Eastern Agricultural Research Center, Sidney, MT.

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Auttis M. Mullins
Dean, College of Agriculture
University of Idaho

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The Authors — D. L. Auld is assistant professor of plant sciences (plant breeding and genetics) and G. A. Murray is professor and crop physiologist, both with the Department of Plant and Soil Sciences. E. F. Mink is Extension agricultural agent in Idaho county, and B. W. Studer is Extension agricultural agent, Boundary county.

The North Idaho Foundation Seed Association provided part of the financial support for this project. Dr. J. W. Bergman of Montana's Eastern Agricultural Research Center, Sidney, MT, contributed data and also provided oil quality analyses.

Issued in furtherance of cooperative extension work in agriculture and home economics. Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, James L. Graves, Director of Cooperative Extension Service, University of Idaho, Moscow, Idaho 83843.