



FLAX, MUSTARD, SPRING RAPE

Alternative Crops for Idaho's Cooler Region?

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FLAX

Flax is grown on approximately 1 million acres annually in the United States. Most of this acreage is located in the dryland areas of North Dakota, South Dakota and Minnesota. Flax yields an average of 550 pounds of seed per acre. Flax seed has sold for 10 to 12 cents per pound in recent years. The seed contains approximately 40% oil, the source of linseed oil which is used in paints, varnishes and lubricants. The meal left after the oil is removed contains 24% protein and is used as a supplement in animal feed rations.

Adaptation

Two flax varieties, Linott and Culbert, were evaluated under dryland conditions at Moscow, Grangeville and Bonners Ferry. These varieties yielded over twice the national average in years with above normal moisture such as 1978 (Table 1). The extreme drought of 1977 severely reduced flax seed yields at all three test locations. Flax should yield between 1,000 and 1,200 pounds of seed per acre when grown in the dryland production areas of northern Idaho in years with adequate moisture. Flax seed must contain a minimum of 40% oil to obtain full market price. The oil content of these varieties approached 40% in all dryland trials except at Grangeville in 1976 where the plots were harvested before the seeds had fully matured.

Flax was grown under irrigation at Coeur d'Alene and Tetonina. In 1977 at Coeur d'Alene, yield exceeded 1,500 pounds of seed per acre (Table 1). In 1977 and 1979, flax at Tetonina yielded about 1,100 pounds of seed per acre. Growing flax under irrigation did not appear to offer any yield advantage at either Coeur d'Alene or Tetonina compared to dryland.

Varietal Tests

Eight varieties of flax were tested at Bonners Ferry and Moscow in small experimental plots to determine which varieties would be best adapted to dryland production in northern Idaho. In the 1977 drought, seed yields at Bonners Ferry ranged from 270 to 770 pounds per acre (Table 2). CI 2822, Culbert and Linott had the best seed yields in this trial, averaging 765 pounds of seed per acre. In the 1978 trials, a recently developed variety, Dufferin, had the highest seed yields and oil content. This variety yielded 1,900 pounds of seed per acre at Moscow and 1,650 pounds at Bonners Ferry.

Dufferin appears to be the variety best adapted for production in the cooler dryland areas of Idaho. When Dufferin was evaluated under irrigation at Tetonina in 1979, it yielded 2,500 pounds of seed per

Table 1. Seed yield and oil content of 2 varieties of flax in the cooler regions of Idaho.

Location	Year	Seed yield		Oil content	
		Linott	Culbert	Linott	Culbert
		(lb./acre)		(%)	
Moscow	1977	180	220	39.6	40.8
	1978	1610	1640	39.4	39.7
Grangeville	1976	950	830	36.7	36.9
	1977	330	—	39.6	—
Bonners Ferry	1977	690	530	40.1	39.8
	1978	1380	1320	40.0	40.6
Coeur d'Alene	1977	1630	1540	40.5	40.8
Tetonina	1977	1060	1060	—	—
	1979	1070	1070	—	—

acre, more than twice the yield of Culbert and Linott. Seed of this variety can be obtained from the North Dakota Crop Improvement Association.

Commercial Production

Small commercial flax fields at Bonners Ferry produced approximately 1,300 pounds of seed per acre in 1977 and 1978. To compete economically with spring-seeded crops such as barley, peas and lentils, flax would need to generate a gross income of \$150 to \$200 per acre. With an expected seed yield of 1,200 pounds per acre, flax producers would need a contract price of 12 to 16 cents per pound to insure a profit from this crop.

Flax should be seeded as early as possible in the spring at the rate of 25 to 30 pounds of seed per acre. The seed should be placed in a firm, moist seed bed at a depth of $\frac{3}{8}$ -inch and covered with a drag chain. Flax should be seeded in rows 6 or 7 inches apart to obtain maximum yields. Poor stands are the most common cause of low yields in flax fields.

Preplant herbicides are available to control both broadleaf and grass weeds. Growers should be sure these herbicides have local labels and apply them according to label directions. No serious insect or disease problems have been observed on the flax grown in northern Idaho.

Flax should mature in mid-August. Flax varieties do not mature uniformly so most fields will need to be swathed when the lower seed pods turn brown to allow the crop to dry before harvest. Flax should be stored at less than 8% moisture



Fig. 1. Leaf damage from flea beetle on spring rape and mustard at Moscow, Idaho.

to avoid spoilage. Marketing flax from the Pacific Northwest would require shipping the crop to mid-western processing plants or exporting the whole seed to foreign markets. **Growers should have a contract from a reputable firm before producing this crop.**

Table 2. Performance of flax at Bonners Ferry and Moscow, 1977 and 1978.

Variety	Bonners Ferry				Moscow	
	1977		1978		1978	
	Seed yield (lb./acre)	Oil content (%)	Seed yield (lb./acre)	Oil content (%)	Seed yield (lb./acre)	Oil content (%)
Dufferin*	—	—	1650a**	41.7	1900a**	41.4
C. I. 2847	275c**	40.2	1120a	41.0	1670ab	40.3
Culbert	760a	40.9	1320a	40.6	1640ab	39.7
Linott	760a	40.3	1380a	40.0	1610ab	39.4
Nored	380bc	39.6	1180a	40.3	1580b	39.5
Bison	540ab	40.3	1170a	39.8	1520b	39.3
C. I. 2840	270c	38.1	1640a	39.8	1520b	39.3
C. I. 2822	770a	40.3	1230a	40.1	1100b	35.2
Average of 3 best varieties	765	40.5	1645	41.1	1740	40.5

*Dufferin was not included in 1977 trials.

**Means within a column not followed by the same letter differ at the 0.05 level of probability by Duncan's new multiple range test.



Fig. 2. Spring mustard plots at Moscow, Idaho, in 1977.

MUSTARD AND SPRING RAPE

Mustard, a minor crop in the United States, is grown on less than 250,000 acres annually. Most of this crop is grown in North Dakota under dryland conditions where seed yields range from 500 to 1,000 pounds per acre. Mustard is used by meat packers and to produce cream salad mustard. Mustard seed is usually grown under contract for 10 to 12 cents a pound.

Spring rape is grown on less than 10,000 acres annually in the United States. However, in recent years Canadian production has expanded to more than 10 million acres. In Canada, the seed yield of rape ranges from 1,500 to 3,000 pounds per acre. Spring rape seed has usually sold for 10 to 20 cents a pound.

The purpose of these trials was to determine if mustard and spring rape are adapted to commercial production in the cooler regions of Idaho.

Adaptation and Variety Testing

Rape and mustard were grown at Moscow and Bonners Ferry under dryland conditions. Six varieties of mustard and two varieties of spring rape were evalu-

ated. At Moscow in both the extreme drought of 1977 and the wetter conditions of 1978, none of the entries yielded more than 1,200 pounds of seed per acre (Table 3). These low seed yields were due in part to stand losses caused by the flea beetle *Phyllotreta pussilla* Horn). In both years these plots had populations of cowpea aphids (*Aphis craccivora* Koch.) and lygus bugs (*lygus* spp.) that required chemical control. In addition most entries flowered in late June and early July when soil moisture was very limited. Neither mustard nor spring rape appeared to be well adapted to dryland production in the Palouse area.

At Bonners Ferry the 1977 drought reduced seed yields. Even the best entries in this trial yielded less than 500 pounds of seed per acre (Table 3). In 1978, two yellow mustard varieties, Yellow no. 2 and Gisilba, yielded 3,240 and 2,950 pounds of seed per acre, respectively. Seed yields of other mustard varieties in this trial ranged from 1,660 to 2,600 pounds per acre. Seed oil content was acceptable for the yellow mustards in both 1977 and 1978. Tower and Span, the spring rape varieties in the 1978 trial, yielded only 1,790 and 1,120 pounds of seed, respectively. The flea beetle required chemical control in both test years and would probably

Table 3. Performance of mustard and spring rape at Bonners Ferry, Coeur d'Alene and Moscow, 1977 and 1978.

Variety	Moscow				Bonners Ferry				Coeur d'Alene	
	1977		1978		1977		1978		1978	
	Seed yield*	Oil content	Seed yield*	Oil content	Seed yield*	Oil content	Seed yield*	Oil content	Seed yield*	Oil content
	(lb./acre)	(%)	(lb./acre)	(%)	(lb./acre)	(%)	(lb./acre)	(%)	(lb./acre)	(%)
Yellow mustard										
Yellow #2	740a	27	640a	29	410a	23	3240a	25	1100a	27
Gisilba	680ab	28	620a	29	270ab	21	2950ab	24	1090a	26
Kirby	580ab	28	650a	29	210abc	21	2450c	24	1100a	27
Oriental mustard										
Stoke	210c	32	1105a	36	30c	28	2260c	34	1080a	31
Lethbridge 22-A	446b	32	830a	37	137bc	23	2600bc	35	1100a	32
Brown mustard										
Common Brown	120c	27	**	**	30c	25	1650d	29	1060a	28
Spring turnip rape										
Span	25	30	**	**	370ab	33	1120e	36	510b	31
Spring Argentine rape										
Tower	20	29	**	**	25c	30	1790d	39	360c	32

*Means within a column not followed by the same letter differ at the 0.05 level of probability by Duncan's new multiple range test.

**Plots were lost to flea beetle damage.

be an economic pest in commercial mustard and spring rape fields.

Yellow and oriental mustard varieties appear to have economic potential in the production area near Bonners Ferry. Native mustard weeds could contaminate fields of mustard and reduce the quality of the crop. Mustard should not be grown in fields known to have high infestations of wild mustards.

The mustard and spring rape varieties evaluated under irrigation at Coeur d'Alene in 1978 yielded less than 1,200 pounds of seed per acre (Table 3). These low yields indicated that both spring rape and mustard would not be economically competitive in this area. In 1977 and 1979, selected mustard and spring rape varieties were grown under irrigation at Tetonia. Mustard yields at Tetonia ranged from 1,480 to 2,710 pounds of seed per acre. Spring rape yields were less than 1,610 pounds per acre. The Oriental type mustards such as Lethbridge 22-A and Stoke may produce good yields at Tetonia. The other mustards and spring rape appeared to be poorly adapted.

Commercial mustard production would probably be most successful in the crop production areas near Bonners Ferry and Tetonia. Additional information on herbicides, insecticides and agronomic practices can be obtained from the North Dakota State University Extension Service and from the Crop Production Division, R. T. French Company. Growers should insure all agricultural chemicals have local labels and should apply those products following label directions.

Because of the extremely limited markets for this crop, potential growers should obtain a firm contract before seeding the crop.

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