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South Dakota Flax Variety Evaluations

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The success of flax production is affected by choice of variety. Carefully examine seed yield, oil content, disease resistance, and maturity. In some cases oil content or other traits may offset a yield advantage.

Yield

Evaluate as much yield data as possible when selecting a variety, looking at relative performance over many locations and years. For example, in this publication, variety comparisons from 3 years and four locations are better than those from a single year or location. Consistently good performance over many environments is called "yield stability."

Good yield stability means that a variety may or may not be the best yielder at all locations, but it ranks high in yield potential at many locations. A variety that ranks in the upper 20% over all locations exhibits better yield stability than one that is the top yielder at two locations but ranks in the lower 40% at two other locations.

To determine if one variety is better than another for a given trait, use the least significant difference (LSD.05) value at the bottom of each data column. This is a statistical way to indicate if a trait differs when comparing two varieties. If two varieties differ by more than the indicated LSD value for a given trait, they will likely differ when grown again under highly similar conditions.

For example, if the trial at Watertown could be repeated exactly as it was in 2006 (Table 1), the yield ranking of AC Watson (22.0 bu/A) and Carter (25.1 bu/A) might change places since their yield difference (3.1 bu/A) is less than the indicated LSD value of 4.1 bu/A.

However, we would expect Carter (25.1 bu/A) to yield more than AC Carnduff (18.2 bu/A) if the test was repeated since their yield difference (6.9 bu/A) is greater than the LSD value of 4.1 bu/A.

In Table 1, the minimum yield of varieties that were in the top-yielding group at a particular location is printed at the bottom of each data column (if significant differences in yield were measured). Any variety meeting or exceeding this minimum yield value differed by less than the LSD.05 value from the highest-yielding variety in the test and is therefore considered to be in the top-yielding group. For example, in the 2006 trial at Watertown there were 13 varieties in the top-yield group. Numerically, Carter had the highest yield (25.1 bu/A). AC Watson, CDC Arras, CDC Bethume, CDC Mons, Omega, Prairie Blue, Rahab 94, Selby, York, FP2112, FP2137, and N325 were also in the top-yielding group because their yields were within one LSD value of Carter.

If the LSD.05 value is indicated as 'ns,' there were no statistically significant differences in yield among the varieties. In other words, the variety yields were all close enough to each other to be essentially the same, considering the amount of variation inherent in the test.

When evaluating yield, look at as many trials as possible. It is unlikely that the environmental conditions of a test will repeat in any future year.

The coefficient of variability (C.V.) listed at the bottom of the data table is a relative measure of the precision or reliability of a test. Generally, trials with low C.V. rates are more reliable for making variety choices than trials with higher C.V. rates. Trials with C.V. rates not exceeding 15–20% may be considered reliable.

Oil content

Among varieties with similar yield potential, select the one with the highest oil content.

Maturity

Later-maturing varieties generally will produce higher yields than early varieties when seeded at normal planting dates. Maturity is particularly important if planting is delayed. In many cases of late seeding, only an early variety will mature properly and exhibit its best yield potential and oil content.

Seed availability and quality

Seed sources for Canadian and some older flax varieties may be limited. Be sure to plant only high-quality seed with good germination. Certified seed is recommended to assure varietal purity, seed viability, and freedom from pathogens and weed seed.

2006 trial procedures

A yield trial of flax varieties and experimental lines from South Dakota, North Dakota, and Canada was grown at the Northeast Research Station (Watertown, S.D.) and Brookings, S.D., in 2006. The purpose of the trial was to provide performance data on released flax varieties to producers and also to compare performance of experimental lines to established checks in order to identify possible new varieties.

In 2006, 10 experimental lines from the NDSU or Canadian flax breeding programs were tested against 20 released varieties. The Watertown trial was planted on April 27. Brookings Early Seeded was planted April 26 and Brookings Late was planted May 23. An additional trial was planted at Brookings on May 23 in a field infested with the flax wilt fungus, *Fusarium oxysporum* f. *lini* to test the resistance of the flax varieties to wilt.

Experimental design at each location was a randomized complete block with three replications. Plots consisted of seven rows 14 ft long with rows spaced 7 inches apart. Plots at all locations were harvested by cutting the middle three rows of each plot with a bundle cutter, then drying and threshing the bundles.

The 2006 growing season began warmer and slightly drier than normal in most of eastern South Dakota. Topsoil moisture was adequate at planting and stands were good at all locations.

The remainder of the growing season was warmer and much drier than normal, resulting in 33% lower yields than in 2005, averaged over all locations.

Table 1 shows the 2006 flax yield data for several sites in South Dakota. Three-year and statewide yield averages are also provided. Table 2 summarizes the characteristics of the varieties included in the performance trials.

Yields were highest at Watertown, averaging 20.8 bu/A across the thirty varieties tested. Yields at Brookings averaged 16.8 bu/A for the early-planted trial and 9.9 bu/A for the late-planted trial.

EXEX8055, revised April 2007. Access at http://agbiopubs.sdstate.edu/articles/ExEx8055.pdf.

Table 1. One and three-year average flax yields (bu/A) at several locations in South Dakota.

Variety	Origin -Year	Brookings Early-seeded 2006	Brookings Early-seeded 3-yr	Brookings Late-seeded 2006	Brookings Late-seeded 3-yr	Watertown 2006	Watertown 3-yr	Webster 2005	Webster 2-yr	Statewide 2006	Statewide 3-yr	State-wide Rank	Yield* Sta-bility
			-3-**		-3-		-3-		-2-	-3-	-11-		
AC Carnduff	CAN-99	16.0	25.2	10.5	18.4	18.2	27.7	23.0	34.6	15.0	25.7	5	3/6
AC Hanley	CAN-02	15.3	22.4	7.5	16.8	16.5	26.1	21.0	33.3	13.3	23.9	18	1/6
AC Watson	CAN-97	18.0	22.9	10.4	17.6	22.0	26.6	22.7	36.7	16.9	25.0	12	2/6
Bison (check)	ND-27	20.0	24.1	9.4	17.1	19.2	24.9	21.3	28.5	16.3	23.2	23	0/6
Carter	ND-05	17.5	25.4	11.2	18.6	25.1	30.2	22.5	32.9	18.1	26.2	2	4/6
Cathay	ND-97	17.3	23.0	9.8	18.4	17.3	23.8	21.5	30.7	14.9	23.3	21	0/6
CDC Arras	CAN-00	14.5	21.8	10.5	19.0	25.0	31.9	25.2	36.8	16.8	26.5	1	4/6
CDC Bethume	CAN-00	15.8	22.9	10.2	18.3	22.9	27.5	26.3	37.0	16.4	25.5	7	4/6
CDC Mons	CAN-03	17.4	24.9	9.0	16.9	21.2	27.0	21.6	33.7	16.0	24.9	14	3/6
CDC Normandy	CAN-96	19.0	24.8	11.6	20.1	20.9	25.2	22.4	32.1	17.3	25.0	13	1/6
Linott (check)	CAN-66	18.0	23.7	10.6	18.3	20.2	26.5	22.5	33.7	16.4	24.8	15	2/6
McGregor (check)	CAN-82	18.1	21.6	8.3	15.5	18.7	27.1	21.7	34.8	15.1	23.8	19	1/6
Nekoma	ND-02	17.5	24.9	12.7	18.1	20.2	28.5	22.0	30.6	17.0	25.1	11	2/6
Omega	ND-90	17.8	22.9	8.7	14.4	24.7	24.7	22.1	32.9	17.2	22.9	24	1/6
Pembina	ND-97	13.7	23.0	9.4	18.4	20.6	27.6	22.2	32.4	14.7	24.7	17	1/6
Prairie Blue	CAN-03	16.4	24.8	8.8	19.6	22.3	27.4	22.5	30.7	16.0	25.2	9	2/6
Rahab 94 (check)	SD-94	13.9	22.2	10.2	17.9	22.8	30.7	21.2	33.5	15.7	25.4	8	3/6
Selby	SD-00	17.9	24.1	9.8	18.4	23.4	27.9	27.3	34.7	17.1	25.5	6	1/6
Webster	SD-98	15.5	23.9	11.7	20.8	20.3	28.1	24.8	34.0	16.0	26.0	3	1/6
York	ND-02	17.4	24.1	10.1	17.2	22.3	29.8	24.0	34.9	16.8	25.7	4	3/6
Experimentals													
FP2112	CAN-exp.	15.1	24.2	8.9	18.7	21.7	27.7	22.5	32.5	15.3	25.2	10	2/6
FP2114	CAN-exp.	16.1	20.8	8.8	16.2	18.2	26.5	20.3	33.3	14.5	23.4	20	1/6
FP2118	CAN-exp.	17.3	22.4	7.0	15.4	18.7	25.3	19.5	33.5	14.5	23.3	22	1/6
FP2119	CAN-exp.	19.5	26.0	8.8	14.8	18.6	26.8	25.1	35.0	15.8	24.8	16	2/6
FP2137	CAN-exp.	16.3	--	11.0	--	21.2	--	--	--	16.3	--	--	3/3
N2010B	ND-exp.	14.2	23.4	11.8	17.1	20.5	27.2	22.7	--	15.6	--	--	3/5
N325	ND-exp.	16.0	23.4	9.4	20.2	22.1	28.3	22.5	--	16.0	--	--	2/5
N414	ND-exp.	18.5	--	10.5	--	20.3	--	--	--	16.6	--	--	1/2
TS 12	ND-exp.	16.1	--	10.2	--	20.8	--	--	--	15.8	--	--	0/2
TS 19	ND-exp.	17.3	--	9.2	--	19.4	--	--	--	15.4	--	--	0/2
Grand Mean		16.8	23.6	9.9	17.8	20.8	27.4	22.5	33.4	16.0	24.8		
Check Mean		17.5	22.9	9.6	17.2	20.2	27.3	21.7	32.6	15.9	24.3		
LSD.05		ns^	ns	2.2	3.5	4.1	ns	ns	ns	ns	2.2		
Minimum yield of top group		--	--	10.5	17.3	21.0	--	--	--	--	24.3		
C.V.		13.0	11.6	13.3	14.1	12.1	11.6	11.3	10.0	13.5	11.8		

* Yield stability = number of times in top yield group/total number of tests having significant differences.
** Indicates the number of environments that were averaged to produce the numbers in the column.
^ ns = differences among the varieties were not statistically significant.

Table 2. Characteristics of flax varieties.

						Statewide Averages					Disease**	
	Origin	Days to	Seed	Color			Height	Yield (bu/A)		Lodgng	Resistance	
Variety	-Year	Flower	Size	Flower	Seed	Oil %	(in.)	2006	3-yr	(1-9)*	Wilt	Rust
		-2-***				-11-	-11-			-2-		
AC Carnduff	CAN-99	53	Small	Blue	Brown	40.3	22	15.0	25.7	1.3	MR	R
AC Hanley	CAN-02	51	Small	Blue	Brown	38.8	20	13.3	23.9	2.2	MR	R
AC Watson	CAN-97	50	Med-Lg	Blue	Brown	40.6	21	16.9	25.0	1.0	MS	R
Bison (check)	ND-27	49	Medium	Blue	Brown	38.9	22	16.3	23.2	1.2	MR	S
Carter	ND-05	51	Small	Blue	Yellow	40.0	21	18.1	26.2	1.5	MS	R
Cathay	ND-97	52	Medium	Blue	Brown	40.7	22	14.9	23.3	1.0	R	R
CDC Arras	CAN-00	54	Medium	Blue	Brown	40.5	22	16.8	26.5	1.0	R	R
CDC Bethume	CAN-00	52	Medium	Blue	Brown	40.3	21	16.4	25.5	1.8	MR	R
CDC Mons	CAN-03	53	Small	Blue	Brown	40.2	21	16.0	24.9	1.0	MR	R
CDC Normandy	CAN-96	51	Med-Sm	Blue	Brown	40.0	21	17.3	25.0	1.2	MR	R
Linott (check)	CAN-66	51	Med-Sm	Blue	Brown	40.3	22	16.4	24.8	1.7	MS	R
McGregor (check)	CAN-82	54	Medium	Blue	Brown	39.2	22	15.1	23.8	1.0	MR	R
Nekoma	ND-02	51	Med-Sm	Blue	Brown	40.7	21	17.0	25.1	1.0	S	R
Omega	ND-90	51	Medium	Blue	Yellow	40.6	21	17.2	22.9	1.5	MS	R
Pembina	ND-97	51	Med-Sm	Blue	Brown	40.3	22	14.7	24.7	1.0	R	R
Prairie Blue	CAN-03	51	Small	Blue	Brown	41.3	21	16.0	25.2	1.0	MR	R
Rahab 94 (check)	SD-94	51	Medium	Blue	Brown	40.8	20	15.7	25.4	1.0	MR	R
Selby	SD-00	52	Medium	Blue	Brown	40.6	22	17.1	25.5	1.3	MR	R
Webster	SD-98	54	Med-Sm	Blue	Brown	40.9	22	16.0	26.0	1.0	MR	R
York	ND-02	53	Medium	Blue	Brown	39.3	21	16.8	25.7	1.0	MR	R
FP2112	CAN-exp.	--	Medium	Blue	Brown	41.2	21	15.3	25.2	2.0	S	R
FP2114	CAN-exp.	--	Large	Blue	Brown	40.3	20	14.5	23.4	2.2	MR	R
FP2118	CAN-exp.	--	Med-Lg	Blue	Brown	41.0	22	14.5	23.3	3.0	R	R
FP2119	CAN-exp.	--	Medium	Blue	Brown	40.1	20	15.8	24.8	1.3	S	R
FP2137	CAN-exp.	--	--	Blue	Brown	--	--	16.3	--	--	--	--
N2010B	ND-exp.	--	Medium	Blue	Brown	--	--	15.6	--	--	MR	R
N325	ND-exp.	--	Medium	Blue	Brown	--	--	16.0	--	--	MS	R
N414	ND-exp.	--	--	Blue	Brown	--	--	16.6	--	--	--	--
TS 12	ND-exp.	--	--	Blue	Brown	--	--	15.8	--	--	--	--
TS 19	ND-exp.	--	--	Blue	Brown	--	--	15.4	--	--	--	--
Grand Mean		51				40.3	21	16.0	24.8	1.5		
Check Mean		51				39.8	21	15.9	24.3	1.2		
LSD.05		ns^				0.6	1	ns	2.2	1.5		
C.V.		2.0				2.0	5.2	13.5	11.8	84.5		

"* Lodging rated on a scale of 1 to 9, where 1=no lodging and 9=flat."
"** R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible."
*** Indicates the number of environments that were averaged to produce the numbers in the column.
^ ns = differences among the varieties were not statistically significant.