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**Effective Straw Management Workshop  
Hosted by SaskFlax**

**February 12-13, 2008  
Saskatoon, Saskatchewan**



# **“What Breeders Need to Know”**

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# The Issue

**Flax straw evaluation is not part of traditional flax breeding.**

**Flax cultivars are registered irrespective of straw characteristics.**

**We do know there are significant differences between flax varieties for fibre content, straw yield and fibre yield.**



# The Concept

**In February of 2007, Linda Braun (Executive Director of SaskFlax) and the three flax breeders (Drs. Rowland, CDC; Duguid, AAFC; and Dribnenki, Viterra) discussed the lack of straw data in the flax cultivar registration system.**

**20 minutes later..., logistics and costs to establish a straw evaluation project were 'more or less' agreed upon. One month later, funding was available from Flax Canada 2015. Dribnenki 'volunteered' to be coordinator of this project.**



# The Project

A separate Flax Straw Co-op was established at Vegreville (Viterra), Saskatoon (Crop Development Centre) and Morden (Agriculture and Agri-Food Canada).

Entries of the Linseed Co-op (traditional) and the NuLin Contract Registration Co-op were involved in this study.

In this short presentation, the Linseed Co-op study will be commented on.



# Test Design

All 28 entries of the Linseed Co-op were included in this special Straw Co-op.

Full plots were used for this test...6 meters long by 1.2 meters wide.

The standing flax plants were harvested when plots were mature and would normally be harvested for seed.

Two - 0.5 m<sup>2</sup> sub-samples were harvested per plot...total sample area per plot was 1.0 m<sup>2</sup>



# Test Design

Plants were harvested from the inner rows of the plots. The outer 1 meter from the back and front of the plot area was not used.

Standing plants were cut at ground level and then re-cut to 12 inches of total straw length.

The straw samples were wrapped in brown paper and tied. Wet samples were dried before shipment to Biolin for analyses.



# Straw Analyses

**Biolin Research Incorporated (Alvin Ulrich), Saskatoon conducted the straw analyses, which included**

- a. % Fibre**
- b. Straw yield**
- c. Fibre yield (% fibre x straw yield)**



# The Results

The Coefficient of Variability (CV) for straw yield, (an indicator of test uniformity) was

- a. Vegreville 9.4%
- b. Saskatoon 24.2%
- c. Morden 16.4%

Overall three location summary CV = 19.1%

For seed yield, acceptable CV's are less than 15%.  
Above that, the tests are aborted. We used all three tests in our straw analyses.



# The Results

I will discuss results of the three location summary as single test results can be quite misleading.



# The Results

% Fibre: Top entry was Flanders @ 10.9%

There were two categories of entries for % fibre

A. 11 experimental entries not significantly different than Flanders

B. 15 experimental entries + CDC Bethune with significantly less fibre than Flanders

Mean % fibre of top group; 9.7%

Mean % fibre of bottom group; 7.4%...31% diff



# The Results

Straw Yield: Top entry was FP2251 @ 1770 kg/ha

Two categories of entries for straw yield;

- A. 17 experimental entries + Flanders + CDC Bethune, not significantly different than FP2251.
- B. 9 entries with significantly less straw than FP2251.

Mean straw yield of top group; 1566 kg/ha

Mean straw yield of bottom group; 1302 kg/ha

Difference in straw yield between groups; 20%



# The Results

Fibre Yield: Top entry was FP2251 @ 181.5 kg/ha

Two categories of entries for fibre yield

- A. 3 experimental lines + Flanders were not significantly different than FP2251.
- B. 22 entries + CDC Bethune, had significantly less fibre yield than FP2251.



# The Results

Fibre Yield (= % fibre x straw yield)

A. Fibre yield of top group was 167 kg/ha  
-4 experimental strains + Flanders

B. Fibre yield of bottom group was 115 kg/ha  
-22 experimental strains + CDC Bethune

There was a 45% difference between the fibre yield of the top group and the bottom group.



# Conclusions

- 1. High fibre yield is a result of high straw yield and high fibre content.**
- 2. 15% of the experimental lines in the Flax Co-op had fibre yields not significantly different than the top entry. ie 15% probability that new varieties would have high fibre yields. Flanders in this group.**
- 3. 85% of the experimental lines in the Flax Co-op had fibre yields significantly lower than the top entry. ie 85% probability that new varieties would have lower fibre yields than top entry. CDC Bethune in this group.**



# Conclusions

4. The straw data from this study will be included in the 2007 Flax Co-op Report.
5. A minimum of three locations per year (Vegreville, Saskatoon and Morden) would provide a preliminary evaluation of straw characteristics for Co-op entries. This project should be continued annually.

# 2007 Flax Co-operative Test Report

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Table 35. Summary of Fibre Quality Data by Stations - 2007 Flax Cooperative Test

ENTRY	Fiber % of Unretted Straw (NIR) <sup>z</sup>				Salvaged Straw Yield (kg/ha) <sup>y</sup>				Fiber Yield (kg/ha) <sup>x</sup>			
	SASK	MORD	VEGE	MEAN	SASK	MORD	VEGE	MEAN	SASK	MORD	VEGE	MEAN
Flanders	10.9	11.7	10.1	10.9	1810.5	1458.0	1274.5	1514.3	197.2	170.0	127.5	164.9
CDC Bethune	4.5	8.7	8.0	7.1	1605.0	1590.0	1282.0	1492.3	75.8	138.5	102.0	105.5
FP2214	9.0	9.2	8.5	8.9	1332.0	1854.0	1319.0	1501.7	117.7	171.1	111.8	133.6
FP2215	10.6	9.6	8.9	9.7	1491.0	1404.0	981.5	1292.2	158.3	134.4	87.5	126.8
FP2223	9.3	9.4	8.9	9.2	2148.5	1648.0	1074.5	1623.7	202.8	153.8	95.0	150.6
FP2234	6.9	8.4	6.3	7.2	1764.0	1450.0	1388.5	1534.2	127.8	121.5	86.7	112.0
FP2235	3.9	8.7	7.7	6.8	1402.0	1571.5	867.0	1280.2	54.8	136.6	66.2	85.5
FP2236	3.4	7.1	7.6	6.0	1643.5	1725.5	1125.5	1498.2	66.5	123.0	84.6	91.4
FP2237	8.0	10.3	8.9	9.1	1462.5	1619.5	1172.5	1418.2	116.8	165.7	104.4	129.0
FP2238	4.6	9.7	8.2	7.5	1123.0	1574.5	1172.5	1290.0	58.2	151.7	96.5	102.2
FP2242	3.5	9.5	8.2	7.1	1721.0	1443.5	1256.5	1473.7	52.1	136.1	103.4	97.2
FP2245	3.1	10.0	8.7	7.3	2071.5	1542.5	1195.0	1603.0	66.3	150.4	104.3	107.0
FP2246	5.7	10.8	10.0	8.8	1052.5	1307.5	1232.5	1197.5	58.5	139.6	122.3	106.8
FP2248	5.2	10.1	8.7	8.0	1422.0	1925.5	1232.0	1526.5	87.8	193.4	107.1	129.4
FP2250	11.8	11.3	9.2	10.8	2123.5	1636.0	1159.5	1639.7	250.7	185.0	107.1	181.0
FP2251	9.7	11.0	10.4	10.4	2133.5	1925.0	1251.5	1770.0	204.7	211.0	128.6	181.5
FP2252	10.2	9.9	8.9	9.7	1762.0	1794.5	1224.0	1593.5	188.9	175.7	109.4	158.0
FP2253	6.7	10.5	8.9	8.7	1836.0	1713.5	1468.5	1672.7	131.5	179.1	130.7	147.1
FP2254	5.8	9.7	9.1	8.2	1940.0	1386.0	1218.0	1514.7	102.0	134.7	111.2	116.0
FP2255	8.9	9.3	8.4	8.9	1517.5	1681.5	1320.0	1506.3	134.8	155.4	110.9	133.7
FP2256	8.5	9.9	4.4	7.6	1584.5	1651.5	1148.5	1461.5	133.1	163.6	55.2	117.3
FP2257	0.9	8.4	7.7	5.7	2081.5	1685.5	1368.0	1711.7	17.1	141.5	105.7	88.2
FP2258	6.5	9.6	4.5	6.9	1286.0	1657.5	1299.0	1414.2	91.0	158.6	57.1	102.3
FP2259	7.1	9.4	9.3	8.6	1622.0	1755.5	1227.0	1534.8	120.0	163.8	114.2	132.7
FP2260	4.6	8.2	8.9	7.2	1651.5	1368.5	1187.5	1402.5	72.8	111.7	106.0	96.8
FP2261	5.9	12.0	10.4	9.4	1653.0	1907.5	1159.0	1573.2	87.6	229.9	120.6	146.0
FP2262	8.7	11.0	8.9	9.5	1578.5	1095.5	1071.5	1248.5	137.4	120.9	95.1	117.7
FP2263	8.4	10.7	9.1	9.4	1122.5	1278.0	1114.0	1171.5	99.3	137.0	101.4	112.4
Mean	6.8	9.8	8.4	8.4	1640.8	1594.6	1206.8	1480.7	114.7	155.5	101.9	124.4
C.V. %	35.4	5.5	20.9	21.0	24.2	16.4	9.4	19.1	32.5	16.5	24.4	24.4
LSD 5%	5.0	1.1	3.6	2.0	815.6	535.9	232.3	324.3	76.5	52.7	51.0	34.3

<sup>z</sup> "NIR Fiber % of Unretted Straw" is the amount of fiber, expressed as a percentage, within the NIR scanned sample scanned on a FOSS 6500

<sup>y</sup> "Salvageable Straw Wt (kg/ha)" in this table is ("1/2m2 Salvaged Straw Wt (g)) x 2

<sup>x</sup> "Fiber Wt. (kg/ha)" is the "Salvaged Straw Wt (kg/ha)" times the "NIR Fiber % on Unretted Straw"



## Flax Biofibre Industry and Breeding ?!?

1. Breeders cannot afford to evaluate straw characteristics (\$600/entry).
2. If straw characteristics are important for the future flax biofibre industry, long term funding will have to be made available to flax breeders.
3. NAFGEN (The Natural Fibres for the Green Economy Network) [approved ABIP] should be a good start to create the foundation for the flax biofibre vision...if breeders actually do receive \$.