

Project 27

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Fiber Flax Variety and Seeding Rate X Seeding Method Trials near Saskatoon in 2001

Biolin Research Inc.

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Project Title: Fiber Flax Variety and Seeding Rate X Seeding Method Trials near
Saskatoon in 2001

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EXECUTIVE SUMMARY

In May of 2001, Biolin Research Inc. ("Biolin") received funding from the Saskatchewan Flax Development Commission ("SaskFlax") to:

1. Compare the seed and content of fourteen fiber flax varieties and two oilseed varieties at a location near Saskatoon in the year 2001; and
2. Compare the seed yields, bast fiber content, and fiber yielding ability of two fiber flax varieties seeded both in rows and broadcast at 40 kg, 80 kg and 120 kg per hectare.

To generate these results, two plot experiments, each with four replicates, were set up about 20 miles from Saskatoon near the village of Aberdeen in May 2001 to produce seed and fiber. The variety trial consisted of fourteen fiber varieties and two oilseed varieties planted on May 24th using a seeding rate of 40 kg/ha in plots with dimensions of 7 meters by 1.22 meters. The seeding rate trial used two fiber varieties planted on May 24th at seeding rates of 40 kg/ha, 80 kg/ha and 120 kg/ha in plots with dimensions of 7 meters by 1.22 meters. Plots were sprayed for weed control at the appropriate time but a lack of moisture and the shallow seeding depth in the seeding method trial led to low or non-existent plant emergence for fiber collection.

Before combining, four or two $\frac{1}{4}$ m² areas of plants were pulled out of the ground, wrapped, labeled and stored. Sub-samples of each of the stems of these pulled plants were prepared and retted by staff of Biolin. A reciprocating blade-type breaker/decorticator was used to roughly separate clean bast fibers from the retted dry straw and final cleaning of the bast fibers was done by hand to calculate fiber yields per hectare.

In September 2001, a plot harvester was used to cut the ripened seed bolls off the stems. The resultant seed was cleaned by ICMS and used to calculate the seed yield of each plot. It is now being stored at Biolin Research Inc. for use in further agronomic trials.

Variety Trial

The results of the variety trials showed that the average plot seed yield of fiber varieties ranged from 133 to 250 kg/ha and average plot seed yield from the oilseed varieties Flanders and Valour yielding 156 kg/ha and 184 kg/ha respectively.

The bast fiber content, expressed as a percent of unretted straw weight, varied from 14.1 to 22.0 percent in the fiber varieties. Only the two oilseed varieties, Flanders and Valour, had fiber contents that were significantly lower than the other tested varieties, at 12.0% and 11.2%, respectively.

The length of straw was assumed to be from the tips of the roots to the top of the seed bolls. The height of plants in plots ranged from 28 to 42 cm in the fiber varieties and 23 to 27 cm in the oilseed varieties, with Electra being significantly taller than Arriane, the "check" variety and Alba, Valour, Flanders and Viking were significantly shorter than Arriane.

The bast fiber yield per hectare was estimated by multiplying the percent of bast fiber in unretted stems by the weight of unretted salvaged straw. This calculation gave bast fiber yields that varied from 170 to 283 kg/ha in fiber varieties and Valour and Flanders, the two oilseed varieties, having significantly lower bast fiber yields of 53 and 59 kg/ha respectively.

Seeding Rate and Method Trial

In the case of the two varieties, Flanders and Hermes, planted by two seeding methods and at three different seeding rates. There was no real significance between seed yields at 40, 80 or 120 kg/ha due in part to a high c.v., but there was a significance between row and broadcast seeding with row seeding providing a higher seed yield. Fiber results were only on the row method as the broadcast method did not produce enough stems that could be tested due to low to non-existent moisture. The average bast fiber percent on unretted straw in row seeding was not significantly different between the three seeding rates but the variety, Hermes, had significantly higher fiber content than the variety, Flanders. Straw length was significantly different between the two varieties with Hermes being significantly taller than Flanders.

The seed yield results showed average plot results ranged from 46 to 259 kg/ha, with row seeding being significantly better than Broadcast seeding.

The bast fiber content in a single plot, expressed as a percent of unretted straw weight, varied from 10.6 to 18.9 percent, although all the averages had higher than 50% c.v. There was a significant difference between Flanders and Hermes with Hermes having a higher fiber content. There was no significant difference in bast fiber content among the seeding rates.

The length of straw was assumed to be from the tips of the roots to the top of the seed bolls. The average height of plants in plots ranged from 29 to 48 cm. There was a significant difference between varieties with Hermes being significantly taller than Flanders. Seeding rates had no significant effect on straw length.

The yield of bast fiber yield per hectare was estimated by multiplying the percent of bast fiber in unretted stems by the weight of unretted salvaged straw. This calculation gave bast fiber yields that varied from 176 to 323 kg/ha. Seed and straw yields, straw length and bast fiber yield were dramatically negatively impacted by the lack of moisture during the growing season.

Conclusions

There are large differences in the bast fiber and seed yielding ability of different fiber flax varieties that can be grown in Saskatchewan. Seeding rates and methods also appear to have significant impacts on such yields. Unfortunately, in this trial the drought impacted very negatively on being able to clearly separate out the expected differences. Resources were not available to determine how quality traits (e.g., fiber fineness) are affected by choice of variety and agronomic practice. More trials over more years and at more locations are needed to increase our knowledge base of what responses can be expected when we choose certain fiber flax varieties and agronomic practices.

TECHNICAL REPORT

Abstract

The seed, straw and bast fiber yields of 16 flax varieties were compared. Several varieties exhibited results that were statistically significantly different. Two varieties were seeded at different rates and with different methods. No seeding rate had a statistically significant effect on seed, straw and bast fiber yield. Seeding in narrow rows may have reduced the possible impact of seeding rates. A lack of moisture during the growing season reduced seed and straw yields and reduced the ability of statistical tests to detect significant differences in results.

Background and Objectives

Background

Farmers in Western Canada seed roughly two million acres of flax every year and consequently produce 800 to 1,200 kg of "salvageable" straw per hectare. Only 10-15% of this straw is collected and used in the manufacture of specialty papers and plastic components or for local farm use. The flax straw that is not removed from the field, for these uses, is normally burnt or chopped and spread. Unfortunately both these options cost farmers time and money and create negative environmental impacts.

Previous agronomic work carried out by Biolin Research has shown that the fiber and seed yielding ability of European fiber flax varieties can vary by more than 100% for a given location in a given year. With such a wide range of possible results, choosing superior varieties and agronomic practices will have a tremendous impact on the profit that farmers and processors can generate from growing such varieties.

This type of work is vitally important to maximize fiber production per hectare and to develop the technical coefficients (e.g., fiber content, fiber yield per hectare etc.) that can be used with confidence in developing business plans and raising investment capital for higher-end flax processing plants and farm operations.

Objectives

In May of 2001, Biolin Research Inc. ("Biolin") received funding from the Saskatchewan Flax Development Commission ("SaskFlax") to:

1. Compare the seed, bast fiber content and fiber yielding ability of fourteen fiber flax varieties and two oilseed varieties at a location near Saskatoon in the year 2001; and
2. Compare the seed yields, bast fiber content, and fiber yielding ability of two fiber flax varieties seeded both in rows and broadcast at 40 kg, 80 kg and 120 kg per hectare.

Experimental Methods

- A plot site was selected on a farm about 4 kilometers south of Aberdeen. This site was chosen because the company contracted to seed and harvest these flax plots had leased land for canola and pulse crops near their central base at Aberdeen and had both a plot seeder and plot harvester. The soil at the site appeared to be a thin black or dark brown loam soil. The previous year the site had been planted to a cereal. A considerable amount of cereal straw remained on the surface and the land has some stones. Before crop planting, the field had been cultivated twice and harrowed three times to better spread and incorporate the straw. No fertilizer was put on before seeding. Since little or no rain fell on the site prior to seeding, the top inch of soil was dry and the flax had to be seeded below one inch for it to be in a moist seedbed.
- The variety trial plots were much the same area as conventional research plots (1.22 X 7 meters or roughly 4 X 23 feet). The plots were set out in four replicated rows of sixteen varieties with the order of the varieties being randomized within each of the four rows. Each plot was planted with a double disk press wheel plot seeder, in narrow seed rows (20 cm apart), using the equivalent of 40 kg/ha of seed. These plots were seeded on May 24th, 2001.
- The rate and method of seeding trial used Flanders, an oilseed flax with relatively high fiber content, and Hermes, a European variety that has been one of the better performing ones in previous trials in Saskatchewan. Each plot was a conventional size (1.22 X 7 meters or roughly 4 X 23 feet). The plots were set out in four replicated rows of twelve different variety/method/seeding rate combinations with the order of the variety, seeding rate and method combinations being randomized within each of the four rows. These plots were seeded on May 24th, 2000. First the broadcast plots were seeded by lifting the disks out of the ground and dropping the seed on top of the ground. The Packer wheels on the seeder were repositioned to cover as much ground as possible. The seed was then raked by hand in three directions before rolling twice with a lawn roller filled with water. The packer wheels were repositioned to pack only the seed in the rows and row seeded plots were then planted. By the time the randomized seeding patterns was complete, all plots in rate and method of seeding trial were driven over or packed twice.
- Due to the dry cool conditions the flax took more than ten days to emerge.
- Total rainfall from May 24th to harvest was about 60 cm and much of this came in little showers that had little effect. After a small amount of rain fell, the equivalent of 40 kg/ha of nitrogen and 20 kg/ha of phosphorous was applied to the plots.
- Four 0.25m² areas of straw with heads on were pulled out of the ground in the variety plots when plants were mature. The straw was pulled from areas randomly selected from portions of the plot that appeared to be of average height and density. In the case of the rate of seeding plots, only two 0.25 m² areas of whole plants were only taken from the row planted plots because many of the seeds in the broadcast plots did not emerge. Although it is normal practice to randomly select four 0.25m² sampling areas from the whole plot, this was not done because, in some areas, the drought had been so severe that only a few flax

plants survived. (i.e., a sampling area in such an empty spot would give an extreme bias to the final result so we picked sample areas only from areas that appeared "normal"). After the straw was pulled it was put inside labeled cardboard rolls or paper bags and put into storage.

- To maximize the amount of sound seed that could be obtained from the plots, the flax plants were allowed to ripen naturally. The plants remaining in all the plots were harvested at the end of September.
- During the winter the samples were processed and the seed was kept and put in separate labeled bags and put into storage.
- From each straw sample collected, a sub-sample bundle of straw 4.1 cm in diameter and 19.1 cm in length was taken. After bundling, each sub-sample was bound with two elastic bands and tagged with a plastic-coated label.
- A sub-sample bundle of straw from each trial was retted separately in a warm water tank for four to six days until the results of the "Fried Shake Test" showed that the majority of bundles were optimally retted. This test involved placing fifteen pieces of retting straw, each approximately 10.0 cm in length, each from a different bundle, in fifteen test tubes half full of boiling water with one piece of straw in each test tube. The test tubes were stoppered and placed in a machine designed by Biolin Research to violently shake test tubes for forty-five seconds. After shaking, the straw in each test tube was visually scored for loose fibers on a whole number scale from "0" to "3" with "0" representing no loose fibers and "3" representing total loosening of all bast fibers on the stem. When the average score was above 2.8 and there were no "0" scores and at least twelve test tubes had a score of "3", the bundles in the batch were considered fully retted. The bundles were then taken out of the tank, rinsed in tap water and set in drying racks for approximately four days to dry.
- Dry bundles were weighed and the fiber was extracted using a reciprocating blade-type breaker/decorticator. The fiber was hand cleaned to the point where few or no shives were left. After cleaning, the fiber was weighed and placed in separate sample bags and labeled.
- Data from the above trials was entered into Excel spreadsheets, sorted and analyzed for statistically significant results using regression analysis with binary variables to represent different varieties and treatments.
- A report was written summarizing what was done and what results were obtained.

Results and Discussion

Summary data from the plots are presented in Tables A-1 to A-8 that appear in the following text section of this report.

Appendix A shows individual plot data for the bast fiber content, fiber yield, seed yield, plant length and salvageable straw yields of all the varieties and agronomic trials that were processed as well as data on seed moisture, seed weight, dry unretted weights, dry retted weights, and length of straw.

Appendix B contains printouts of the regression equations that were selected as being those that best made use of the data that was generated by these trials and that show which explanatory variables, if any, have a statistically significant impact on seed, straw and bast fiber percent and bast fiber yield.

Variety Trials

Seed Yields

Due to the lack of rain (the least in 100 years), average seed yields were roughly 15 – 25% of the yield one might expect in a normal year. In addition to much lower than expected yields, the plot seed yields showed a high variation in seed yields even among the same variety. This made it difficult to find statistically significant differences in yields between varieties and treatments unless they were extremely different. Surprisingly both of the oilseed varieties, Valour and Flanders, had lower seed yields than many of the fiber varieties.

The seed yield of individual plots ranged from 49 to 339 kg/ha in the fourteen fiber flax varieties and from 39 to 398 kg/ha in the oilseed varieties (see Table 1 in Appendix A). When we consider the four plot averages for each variety, the yields ranged from 133 to 251 kg/ha from the fourteen fiber flax varieties and from 156 to 184 kg/ha for the oilseed varieties (see Table 1). Regression analysis showed that there was no significant difference between any of the varieties (see Equation B-1 in Appendix B).

Straw Length

The straw length from individual variety plots varied from 19 to 46 cm (see Table A-4 in Appendix A). The four plot average straw lengths varied from 28 to 42 cm in fiber varieties and from 23 to 27 in oilseed varieties (Table 4) with Electra having significantly higher straw lengths and Alba, Viking, Valour and Flanders having significantly lower straw length than Arriane, the variety used as the intercept term in the regression equation (see Equation B-2). These results are partially expected since the oilseed varieties Valour and Flanders, are normally shorter than fiber varieties.

Bast Fiber Content

The bast fiber content, based on unretted straw, of individual plots ranged from 12.8 to 26.0 percent in the fourteen fiber flax varieties and from 8.9 to 13.5 percent in the oilseed varieties (see A-3 in Appendix A). Average bast fiber content was lower than the content one might expect in a normal year. When we consider the four plot averages for each variety, the bast fiber content, expressed as a percent of unretted straw weight, varied from 14.1 to 22.0 percent in fiber varieties and 11.2 to 12.0 percent in oilseed varieties (see Table 2). Hermes, Electra, and Diane had fiber contents that were statistically significantly higher than Arriane, the variety used as the intercept in the regression equation and Viking, Flanders and Valour had fiber contents that were significantly lower (see Equation B-3 in Appendix B).

Bast Fiber Yield

The yield of bast fiber per hectare was estimated by multiplying the percent of bast fiber in unretted stems by the weight of unretted salvaged straw. This calculation gave individual plot bast fiber yields of 132 to 335 kg/ha in the fiber varieties and 37 to 69 kg/ha in the oilseed varieties (see Table A-2). Four plot average bast fiber yields varied from 165 to 283 kg/ha in the fiber varieties and 53 to 59 kg/ha in the oilseed varieties (see Table 3). Electra, Diane and Hermes had significantly higher bast fiber yield per hectare and Valour and Flanders had significantly lower bast fiber yield than Arriane, the variety used as the intercept in the regression equation. (see Equation B-4 in Appendix B). These results are partially expected since the low bast fiber yields are from varieties that have significantly low fiber content or low salvageable straw yields.

It should be pointed out that there are several ways to estimate and calculate the weight of unretted salvage straw depending on the assumptions one makes regarding the harvest method that would be normally be used to salvage the straw in a normal size field on a farm. In this set of trials, we assumed that the average salvageable yield was 27% of the total unretted plant weight including seed, chaff, seed holders, stems and roots) in oilseed flax varieties and 50% of the total plant weight in fiber flax varieties. These percentages were based on some previous unpublished research work carried by Biolin Research Inc in which the individual weights of different plant components were taken and then expressed as a percentage of the total plant weight. In actual farm practice, the salvageable weight will depend on how high the stubble is cut above the ground and how far below the seed bolls the stems are cut since these two cuts determine the maximum stem length. Although salvageable straw yields in a farm situation and/or in a normal year may vary from what we have calculated in those trials, the relative merits of a particular variety should not change.

Table 1 - Variety Trial Averages - Sorted on Seed Yield

Variety	Straw Length (cm) /a	Unretted 1m² wt (g) /b	Salvageable Straw Wt (kg/ha) /c	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
Viking	28	120	1203	14.1%	170	251
Electra	42	129	1291	22.0%	283	250
Diane	37	134	1336	21.1%	282	212
Hermes	35	119	1189	21.5%	255	202
Jitka	32	115	1155	18.3%	211	202
Arriane	35	119	1195	16.7%	200	194
Evelin	33	116	1162	19.1%	224	193
Ilona	32	110	1100	16.0%	175	186
Valour	27	88	475	11.2%	53	184
Escalina	32	105	1049	17.6%	186	178
Laura	34	115	1145	17.2%	199	168
Elise	34	111	1111	16.4%	183	160
Flanders	23	94	506	12.0%	59	156
Caeser	34	128	1280	18.4%	235	150
Alba	28	111	1114	14.9%	165	147
Opaline	35	112	1122	18.8%	213	133

Notes:

Plots were 4ft X 23ft = 92 ft² = 8.6 m² = 0.00086ha = 0.000348acre.

39.368 bushels per tonne, 1000kg per tonne, 4047 m² per acre.

Color and/or shading indicates performance grouped by quartiles.

a/ Straw length is approximately average from ground level

b/ All 1m² weights have roots and seed attached

c/ Based on average % of straw that is usable when plants are short and grown under stressed conditions times the Unretted 1m² total plant weight times 10,000 m² per hectare divided by 1,000g per kg

d/ Fiber yield is based on Fiber % of Unretted Straw times Salvageable Straw Weight

Table 2 - Variety Trial Averages - Sorted on Bast Fiber Content

Variety	Straw Length (cm) /a	Unretted 1m² wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
Electra	42	129	1291	22.0%	283	250
Hermes	35	119	1189	21.5%	255	202
Diane	37	134	1336	21.1%	282	212
Evelin	33	116	1162	19.1%	224	193
Opaline	35	112	1122	18.8%	213	133
Caeser	34	128	1280	18.4%	235	150
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Escalina	32	105	1049	17.6%	186	178
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Arriane	35	119	1195	16.7%	200	194
Elise	34	111	1111	16.4%	183	160
Ilona	32	110	1100	16.0%	175	186
Alba	28	111	1114	14.9%	165	147
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Color and/or shading indicates performance grouped by quartiles.

a/ Straw length is approximately average from ground level

b/ All 1m² weights have roots and seed attached

c/ Based on average % of straw that is usable when plants are short and grown under stressed conditions times the Unretted 1m² total plant weight times 10,000 m² per hectare divided by 1,000g per kg

d/ Fiber yield is based on Fiber % of Unretted Straw times Salvageable Straw Weight

Table 3 - Variety Trial Averages - Sorted on Fiber Yield

Variety	Straw Length (cm) /a	Unretted 1m² wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
Electra	42	129	1291	22.0%	283	250
Diane	37	134	1336	21.1%	282	212
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Notes:

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39.368 bushels per tonne, 1000kg per tonne, 4047 m² per acre.

Color and/or shading indicates performance grouped by quartiles.

a/ Straw length is approximately average from ground level

b/ All 1m² weights have roots and seed attached

c/ Based on average % of straw that is usable when plants are short and grown under stressed conditions times the Unretted 1m² total plant weight times 10,000 m² per hectare divided by 1,000g per kg

d/ Fiber yield is based on Fiber % of Unretted Straw times Salvageable Straw Weight

Table 4 - Variety Trial Averages - Sorted on Straw Length

Variety	Straw Length (cm) /a	Unretted 1m ² wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
Electra	42	129	1291	22.0%	283	250
Diane	37	134	1336	21.1%	282	212
Hermes	35	119	1189	21.5%	255	202
Opaline	35	112	1122	18.8%	213	133
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39.368 bushels per tonne, 1000kg per tonne, 4047 m² per acre.
Color and/or shading indicates performance grouped by quartiles.

a/ Straw length is approximately average from ground level
b/ All 1m² weights have roots and seed attached
c/ Based on average % of straw that is usable when plants are short and grown under stressed conditions times the Unretted 1m² total plant weight times 10,000 m² per hectare divided by 1,000g per kg
d/ Fiber yield is based on Fiber % of Unretted Straw times Salvageable Straw Weight

Seeding Rate and Method Trial

The data gathered from this trial does not accurately reflect what would be expected in a normal year due to the lack of moisture and, the poor growth of the broadcast method.

Seed Yields

The individual plot yields ranged from 3 to 511 kg/ha (see Table A-6) with the four plot average seed yields ranging from 46 to 259 kg/ha (See Table 5). The seed yield of the row seeding method was significantly higher than broadcast seeding (see Equation B-5).

Straw Length

Straw lengths from individual plots varied from 24 to 48 cm (see Table A-16) and average straw lengths that varied from 27 to 39 cm (see Table 8). Hermes was significantly higher than Flanders (See Equation B-6).

Many of the broadcast plots came up so poorly that a good sample of straw could not be obtained and hence some of the results in the tables are blank. In the case of regressions, only row seeded results were used and hence the number of observations is 24 and not the 48 that would be expected (see Equation B-6 in Appendix B). Due to the low plant stands and seed yields, only two 0.25m² areas of plants were pulled out in each of row seeded plots.

Bast Fiber Content

The individual plot results ranged from 8.6 to 21.8 percent and the four plot averages of bast fiber content, based on unretted straw, ranged from 10.6 to 19.2 percent (see Table 6). Hermes had significantly higher fiber content than Flanders (see Equation B-7 in Appendix B).

Bast Fiber Yield

The individual plots ranged from 52 to 517 kg/ha, and the four plot averages ranged from 176 to 323 kg/ha (See Table 7). The yield of bast fiber yield per hectare was estimated by multiplying the percent of bast fiber of unretted straw by the calculated weight of unretted pulled ½m² samples adjusted for the percentage of plant weight that could likely be salvaged (see variety trials for a more detailed explanation). Hermes produced significantly more bast fiber yield than Flanders but there was no significant difference in bast fiber yield due to seeding rates (see Equation B-8 in Appendix B).

Table 5 - Seeding Rate Trial Averages - Sorted on Seed Yield

Variety	Seeding Method	Seeding Rate (kg/ha)	Straw Length (cm) /a	1m ² wt (g) /b	Salvageable Straw Wt (kg/ha) /c	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
Flanders	Row	40	28.4	167.5	1674.5	10.6%	176.1	258.8
Flanders	Row	80	27.4	166.6	1665.5	12.1%	193.0	253.2
Hermes	Row	120	36.9	168.5	1684.5	18.9%	323.2	201.9
Hermes	Row	80	36.4	145.4	1454.0	19.2%	288.2	185.1
Hermes	Row	40	39.4	163.5	1634.5	16.3%	280.8	178.8
Flanders	Row	120	26.8	166.9	1669.0	11.5%	197.7	121.8
Flanders	Broadcast	80						92.2
Hermes	Broadcast	40						89.0
Flanders	Broadcast	120						68.8
Flanders	Broadcast	40						58.1
Hermes	Broadcast	80						49.2
Hermes	Broadcast	120						46.1

Notes:

Plots were 4ft X 23ft = 92 ft² = 8.6 m² = 0.00086ha = 0.000348acre.

39.368 bushels per tonne, 1000kg per tonne, 4047 m² per acre.

Color and/or shading indicates performance grouped by quartiles.

a/ Straw length is approximately average from ground level

b/ All 1m² weights have roots and seed attached and are double the ½m² weights

c/ Based on average amount of straw that is usable when plants are short and grown
under stressed conditions times the unretted ½m² total plant weight times 2 times
10,000 m² per hectare divided by 1,000g per kg

d/ Fiber Yield is based on Fiber % of Unretted straw times Salvageable Straw Weight

Table 6 - Seeding Rate Trial Averages - Sorted on Fiber % of Unretted Straw

Variety	Seeding Method	Seeding Rate (kg/ha)	Straw Length (cm) /a	1m ² wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
Hermes	Row	80	36.4	145.4	1454.0	19.2%	288.2	185.1
Hermes	Row	120	36.9	168.5	1684.5	18.9%	323.2	201.9
Hermes	Row	40	39.4	163.5	1634.5	16.3%	280.8	178.8
Flanders	Row	80	27.4	166.6	1665.5	12.1%	193.0	253.2
Flanders	Row	120	26.8	166.9	1669.0	11.5%	197.7	121.8
Flanders	Row	40	28.4	167.5	1674.5	10.6%	176.1	258.8
Flanders	Broadcast	80						92.2
Hermes	Broadcast	40						89.0
Flanders	Broadcast	120						68.8
Flanders	Broadcast	40						58.1
Hermes	Broadcast	80						49.2
Hermes	Broadcast	120						46.1

Notes:

Plots were 4ft X 23ft = 92 ft² = 8.6 m² = 0.00086ha = 0.000348acre.

39.368 bushels per tonne, 1000kg per tonne, 4047 m² per acre.

Color and/or shading indicates performance grouped by quartiles.

a/ Straw length is approximately average from ground level

b/ All 1m² weights have roots and seed attached and are double the ½m² weights

c/ Based on average amount of straw that is usable when plants are short and grown under stressed conditions times the unretted ½m² total plant weight times 2 times 10,000 m² per hectare divided by 1,000g per kg

d/ Fiber Yield is based on Fiber % of Unretted straw times Salvageable Straw Weight

Table 7 - Seeding Rate Trial Averages - Sorted on Fiber Yield

Variety	Seeding Method	Seeding Rate (kg/ha)	Straw Length (cm) /a	1m² wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
Hermes	Row	120	36.9	168.5	1684.5	18.9%	323.2	201.9
Hermes	Row	80	36.4	145.4	1454.0	19.2%	288.2	185.1
Hermes	Row	40	39.4	163.5	1634.5	16.3%	280.8	178.8
Flanders	Row	120	26.8	166.9	1669.0	11.5%	197.7	121.8
Flanders	Row	80	27.4	166.6	1665.5	12.1%	193.0	253.2
Flanders	Row	40	28.4	167.5	1674.5	10.6%	176.1	258.8
Flanders	Broadcast	80						92.2
Hermes	Broadcast	40						89.0
Flanders	Broadcast	120						68.8
Flanders	Broadcast	40						58.1
Hermes	Broadcast	80						49.2
Hermes	Broadcast	120						46.1

Notes:

Plots were 4ft X 23ft = 92 ft² = 8.6 m² = 0.00086ha = 0.000348acre.

39.368 bushels per tonne, 1000kg per tonne, 4047 m² per acre.

Color and/or shading indicates performance grouped by quartiles.

a/ Straw length is approximately average from ground level

b/ All 1m² weights have roots and seed attached and are double the ½m² weights

c/ Based on average amount of straw that is usable when plants are short and grown under stressed conditions times the unretted ½m² total plant weight times 2 times 10,000 m² per hectare divided by 1,000g per kg

d/ Fiber Yield is based on Fiber % of Unretted straw times Salvageable Straw Weight

Table 8 - Seeding Rate Trial Averages - Sorted on Straw Length

Variety	Seeding Method	Seeding Rate (kg/ha)	Straw Length (cm) /a	1m ² wt (g) /b	Salvageable Straw Wt (kg/ha) /c	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
Hermes	Row	40	39.4	163.5	1634.5	16.3%	280.8	178.8
Hermes	Row	120	36.9	168.5	1684.5	18.9%	323.2	201.9
Hermes	Row	80	36.4	145.4	1454.0	19.2%	288.2	185.1
Flanders	Row	40	28.4	167.5	1674.5	10.6%	176.1	258.8
Flanders	Row	80	27.4	166.6	1665.5	12.1%	193.0	253.2
Flanders	Row	120	26.8	166.9	1669.0	11.5%	197.7	121.8
Flanders	Broadcast	80						92.2
Hermes	Broadcast	40						89.0
Flanders	Broadcast	120						68.8
Flanders	Broadcast	40						58.1
Hermes	Broadcast	80						49.2
Hermes	Broadcast	120						46.1

Notes:

Plots were 4ft X 23ft = 92 ft² = 8.6 m² = 0.00086ha = 0.000348acre.

39.368 bushels per tonne, 1000kg per tonne, 4047 m² per acre.

Color and/or shading indicates performance grouped by quartiles.

a/ Straw length is approximately average from ground level

b/ All 1m² weights have roots and seed attached and are double the ½m² weights

c/ Based on average amount of straw that is usable when plants are short and grown under stressed conditions times the unretted ½m² total plant weight times 2 times 10,000 m² per hectare divided by 1,000g per kg

d/ Fiber Yield is based on Fiber % of Unretted straw times Salvageable Straw Weight

Conclusions and Impact

Conclusions

Variety Trial

Seed and straw yields were roughly 15% the normal expected yield because of a severe lack of moisture (e.g., the oilseed varieties had average seed yields of 2.5 to 3.0 bushels/acre compared to a normal expected yield of flax on stubble near Saskatoon of 20 to 25 bushels per acre).

There is usually a tremendous difference between the seed yields of oilseed and fiber varieties (i.e., Valour and Flanders yield roughly three times as much seed as the average fiber flax variety), however, in this trial, there was only a 38% difference in seed yields between the highest seed yielding oilseed variety (Valour) and the lowest seed yielding fiber variety (Opaline). This shows that although all the fiber varieties tested will grow and mature in Saskatchewan, there is a tremendous range of seed yield outcomes. Only continued testing over a number of years and locations will verify which fiber varieties are truly the most suited for Saskatchewan conditions. (The reader could compare this result to the summary data presented in the *Saskatchewan Seed Guide 2000* that shows average seed yield differences of 10% or less between the highest and lowest oilseed varieties that are recommended for planting in a particular soil type.)

Processors of flax straw are most interested in the percentage of fiber in a given quantity of straw. This trial showed the fiber content of the two oilseed varieties to be, on the average between 11.2 and 12.0% while the fiber varieties had fiber contents that ranged from 14.1% to 22.0%. Thus, these trials indicates that a processor could expect to get roughly 183% more fiber from a given weight of straw if that straw is from a fiber variety. Fiber varieties are generally taller than oilseed varieties and in these trials the straw from the oilseed varieties was roughly 23 to 27 cm in length while the length in the best four fiber varieties ranged from 33 to 42 cm. This means that the length of straw of the tallest four fiber varieties was roughly 145% more than of the oilseed varieties. If we consider fiber yield as a function of the weight of salvageable straw and the fiber content of the straw, calculations show that the oilseed varieties produced 53 to 59 kg/ha of fiber while the best four fiber varieties produced from 235 to 283 kg/ha of fiber. This mean that, on average, the best four fiber varieties produced about 4.6 times more fiber per hectare that the oilseed varieties. However, we should note that there was more than 71.5% difference in fiber yield per hectare between the highest and lowest fiber varieties. Such a large percentage difference once again points out that although all the fiber varieties tested will grow and mature in Saskatchewan, there is a tremendous range of outcomes. Only continued testing over a number of years and locations will verify which fiber varieties are truly the most suited for Saskatchewan conditions.

Seeding Rate and Method Trial

The seeding rates (40, 80 and 120 kg/ha) had no significance in seed, straw length, fiber % and fiber yield. Hermes was significantly taller than Flanders and has a significantly higher fiber % and produced significantly more bast fiber per hectare than Flanders. Surprisingly there was no significant difference in seed yields between Flanders and Hermes. In terms of comparison between broadcast and row seeding methods, only seed was harvested due to the very poor plant stands of the broadcast plots. Seed and straw yields were higher in row seeded plots although only seed yields were measured.

The author of this report hypothesizes, that in years of severe drought, straw yield, fiber yield and fiber % will not differ significantly among seeding rates of 40, 80 or 120 kg/ha and that any seeds not in moisture at the time of seeding will do poorly. Resources were not available to test this or compare all the possible fiber characteristics (e.g., speed of retting, fineness of fiber, ease of cleaning) that could be significantly affected by seeding rates, seeding methods and varieties.

Flax fibers can range in value from less than \$300/tonne to more than \$4,000/tonne. Almost all the difference in price is due to differences in quality parameters. Agronomic practices can have a very big impact on the ultimate quality of fiber that can be produced. Research work needs to be done to look at how different quality traits are affected by agronomic practices.

Impact

It is really too early in the development of flax fiber based industries in Saskatchewan for the results of these trials to have any immediate impact, however, the results are helping to build a knowledge base that can start to be used when planning various options and business plans to set up or expand flax fiber based processing industries. As with most agronomic trials, these trials should be repeated over a number of years and locations because the wide range of weather and soil conditions in Saskatchewan (among years and locations) can greatly affect agronomic results and long term conclusions. This makes it very risky to assume one trial at one location in one year will truly represent the long terms averages that might be expected.

The drought was so bad no conclusions for normal conditions can be made regarding methods and rates of seeding other than that in a dry year, if seed is not in moisture when seeded, the seed and straw yield will be even worse than that just produced by drought. The fiber yield per hectare of the best four varieties are much, much lower than in a normal year but these varieties (with the exceptions of Electra and Ceaser which was tested for the first time in this trial) have shown superior performance in previous years in terms of fiber yield and are also among the highest in terms of seed yield.

The reader is reminded that actual results in a given year at a given location may be much higher than those indicated in this example. Given results like this, we can see that the profitability of growing flax for seed multiplication and/or fiber production will greatly depend on the producer and processor's knowledge of the technical coefficients (i.e., yields, response rates) that can be expected or planned for over the long run. The differences in outcome in this trial are much greater than most of the differences experienced when simply testing for seed yield differences in new oilseed flax varieties and yet, every year, new oilseed varieties of flax are tested in at least twelve different locations in Saskatchewan. Given the very large differences in bast fiber yields per hectare that were experienced in the variety and rate of seeding trial that has just been described, many more trials are definitely needed to increase our ability to state, WITH CONFIDENCE, what technical responses (e.g., bast fiber percentage, bast fiber yield, seed yield) we will get when we vary agronomic practices and how these will likely impact the profitability of what we are doing.

Appendix A

Data on Individual Plot Results

Table A-1 - Variety Trials Sorted on Seed Yield

Plot	Rep	Variety	Straw Length (cm) /a	Unretted 1m ² wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted Bundle wt (g)	Fiber wt (g)	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
42	3	Viking	30.0	137.5	1375.0	32.50	24.9	4.2	14.2%	195.8	338.6
57	4	Electra	44.0	150.2	1502.0	40.20	31.7	7.6	20.2%	303.6	324.6
43	3	Electra	44.0	136.2	1362.0	38.90	30.2	7.7	21.1%	287.3	313.9
53	4	Viking	26.0	128.5	1285.0	31.40	23.4	4.1	14.1%	181.7	312.4
56	4	Jitka	36.0	132.9	1329.0	36.90	27.6	6.4	18.7%	248.7	301.3
58	4	Flanders	21.0	124.0	669.6	30.70	16.7	2.9	10.2%	68.4	298.1
45	3	Hermes	39.0	137.4	1374.0	38.30	29.2	7.7	21.3%	293.1	292.3
63	4	Valour	26.0	93.2	503.3	24.60	18.5	2.5	11.3%	56.9	287.1
16	1	Valour	29.0	106.6	575.6	29.20	21.5	3.2	12.0%	69.2	285.3
44	3	Diane	38.0	153.6	1536.0	40.80	32.4	8.4	21.8%	335.1	262.9
59	4	Arriane	33.0	110.1	1101.0	30.80	22.7	5.0	17.5%	192.5	262.4
60	4	Alba	32.0	138.5	1385.0	35.40	26.4	5.1	15.5%	214.7	259.8
61	4	Escalina	35.0	115.7	1157.0	30.40	22.7	5.0	17.7%	205.1	253.6
55	4	Diane	40.0	141.5	1415.0	35.40	26.6	6.8	20.6%	291.6	246.8
50	4	Evelin	34.0	112.5	1125.0	31.90	24.3	5.4	18.2%	205.2	241.8
46	3	Laura	39.0	140.2	1402.0	38.10	29.0	6.9	19.2%	269.5	240.0
51	4	Ilona	34.0	114.1	1141.0	30.30	22.6	5.1	18.1%	206.5	230.3
31	2	Electra	46.0	119.8	1198.0	30.90	24.4	7.4	26.0%	311.1	220.8
29	2	Evelin	39.0	136.7	1367.0	31.70	24.6	6.8	23.1%	316.2	220.3
48	3	Jitka	31.0	131.7	1317.0	33.80	24.6	5.7	18.2%	239.1	217.3
32	2	Viking	29.0	106.9	1069.0	26.80	20.1	3.4	13.9%	148.4	215.3
30	2	Arriane	37.0	135.7	1357.0	37.40	28.2	6.3	17.9%	242.9	208.3
37	3	Evelin	28.0	114.8	1148.0	31.20	23.0	5.0	17.4%	199.3	203.2
54	4	Hermes	33.0	129.3	1293.0	36.50	26.3	7.3	21.3%	275.2	198.1
27	2	Hermes	37.0	103.1	1031.0	28.40	21.5	5.9	22.8%	234.9	192.9
49	4	Laura	36.0	125.8	1258.0	35.90	26.4	5.7	17.1%	215.3	190.4
15	1	Diane	36.0	110.1	1101.0	28.80	22.1	5.9	22.2%	244.2	187.8
52	4	Caeser	36.0	121.7	1217.0	39.20	29.1	6.4	17.5%	212.8	187.8
14	1	Ilona	34.5	125.1	1251.0	37.20	27.5	4.7	13.4%	168.0	187.8
38	3	Arriane	33.0	109.8	1098.0	30.00	19.9	4.3	15.6%	171.7	187.0
47	3	Escalina	30.5	119.4	1194.0	29.60	22.5	5.2	19.2%	229.1	182.6

Plot	Rep	Variety	Straw Length (cm) /a	Unretted 1m ² wt (g) /b	Salvageable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted Bundle wt (g)	Fiber wt (g)	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
64	4	Elise	32.0	98.6	986.0	27.20	19.6	3.6	14.3%	141.4	182.6
13	1	Elise	38.0	141.5	1415.0	38.50	29.2	6.2	17.2%	243.0	174.9
12	1	Jitka	30.5	100.9	1009.0	27.60	20.1	4.7	18.7%	188.2	174.9
62	4	Opaline	37.0	125.8	1258.0	34.00	25.7	6.5	20.4%	256.3	167.2
18	2	Ilona	32.0	91.6	916.0	24.40	18.6	3.4	15.3%	140.3	167.2
34	3	Elise	35.0	104.5	1045.0	29.60	22.6	5.2	19.1%	199.8	164.6
11	1	Escalina	33.0	86.3	863.0	31.00	22.6	4.4	15.3%	132.3	162.1
28	2	Caesar	38.0	126.6	1266.0	38.60	30.5	7.9	21.9%	277.0	159.5
41	3	Ilona	29.0	109.2	1092.0	30.40	22.3	4.8	17.1%	186.5	159.5
36	3	Flanders	28.0	107.3	579.4	26.20	19.2	2.6	10.9%	63.3	154.4
40	3	Caesar	29.0	142.7	1427.0	43.50	32.4	7.3	17.9%	255.3	151.8
24	2	Diane	34.0	129.1	1291.0	32.90	24.3	6.1	19.9%	257.4	149.2
39	3	Opaline	31.5	116.8	1168.0	36.00	26.7	6.0	18.0%	209.8	146.6
21	2	Alba	28.0	98.4	984.0	28.10	20.2	3.8	14.8%	146.1	144.1
7	1	Electra	35.0	110.3	1103.0	30.90	22.9	5.9	20.8%	230.0	138.9
3	1	Viking	27.0	108.2	1082.0	24.00	17.6	3.1	14.2%	153.9	138.9
35	3	Alba	31.0	84.7	847.0	25.40	18.2	3.8	16.5%	139.3	133.8
4	1	Opaline	38.0	118.5	1185.0	33.80	26.2	6.1	19.4%	230.2	131.2
6	1	Flanders	19.0	73.3	395.8	23.40	16.7	2.8	13.5%	53.3	131.2
5	1	Laura	31.0	107.4	1074.0	29.10	21.0	4.4	16.5%	177.7	128.6
9	1	Hermes	32.0	105.7	1057.0	33.50	24.6	6.4	20.5%	216.8	126.1
2	1	Arriane	35.0	122.3	1223.0	31.70	23.7	4.7	15.9%	194.9	118.3
26	2	Elise	31.0	99.8	998.0	26.10	18.8	3.6	15.0%	149.7	118.3
20	2	Valour	23.0	75.2	406.1	21.70	16.0	2.4	12.4%	50.2	115.8
19	2	Escalina	30.0	98.3	983.0	26.00	19.1	4.3	18.2%	179.1	113.2
22	2	Jitka	31.0	96.3	963.0	30.60	22.3	4.9	17.5%	168.5	113.2
23	2	Laura	29.0	84.7	847.0	25.60	18.1	3.6	15.8%	133.7	113.2
8	1	Evelin	32.0	100.8	1008.0	30.50	22.2	4.9	17.5%	176.4	105.5
10	1	Caesar	32.0	120.9	1209.0	37.70	27.4	5.7	16.2%	195.8	102.9
25	2	Opaline	32.0	87.7	877.0	29.00	21.4	4.7	17.6%	154.4	87.5
1	1	Alba	21.0	124.0	1240.0	30.70	22.2	3.6	12.8%	158.9	48.9
33	3	Valour	28.0	77.0	415.8	20.10	14.8	1.6	8.9%	37.2	48.9
17	2	Flanders	22.0	70.1	378.5	20.40	14.7	2.4	13.3%	50.2	38.6

Plot	Rep	Variety	Straw Length (cm) /a	Unretted 1m ² wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted Bundle wt (g)	Fiber wt (g)	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
Notes: Plots were 4ft X 23ft = 92 ft ² = 8.6 m ² = 0.00086ha = 0.000348acre. 39.368 bushels per tonne, 1000kg per tonne, 4047 m ² per acre. Plots were seeded May 24/01 at 40 kg/ha a/ Straw length is approximately average from ground level b/ All 1m ² weights have roots and seed attached and are double the ½m ² weights c/ Based on average amount of straw that is usable when plants are short and grown under stressed conditions times the unretted ½m ² total plant weight times 2 times 10,000 m ² per hectare divided by 1,000g per kg d/ Fiber Yield is based on Fiber % of Unretted straw times Salvageable Straw Weight											

Table A-2 - Variety Trials Sorted on Fiber Yield

Plot	Rep	Variety	Straw Length (cm) /a	Unretted 1m ² wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted Bundle wt (g)	Fiber wt (g)	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
44	3	Diane	38.0	153.6	1536.0	40.80	32.4	8.4	21.8%	335.1	262.9
29	2	Evelin	39.0	136.7	1367.0	31.70	24.6	6.8	23.1%	316.2	220.3
31	2	Electra	46.0	119.8	1198.0	30.90	24.4	7.4	26.0%	311.1	220.8
57	4	Electra	44.0	150.2	1502.0	40.20	31.7	7.6	20.2%	303.6	324.6
45	3	Hermes	39.0	137.4	1374.0	38.30	29.2	7.7	21.3%	293.1	292.3
55	4	Diane	40.0	141.5	1415.0	35.40	26.6	6.8	20.6%	291.6	246.8
43	3	Electra	44.0	136.2	1362.0	38.90	30.2	7.7	21.1%	287.3	313.9
28	2	Caeser	38.0	126.6	1266.0	38.60	30.5	7.9	21.9%	277.0	159.5
54	4	Hermes	33.0	129.3	1293.0	36.50	26.3	7.3	21.3%	275.2	198.1
46	3	Laura	39.0	140.2	1402.0	38.10	29.0	6.9	19.2%	269.5	240.0
24	2	Diane	34.0	129.1	1291.0	32.90	24.3	6.1	19.9%	257.4	149.2
62	4	Opaline	37.0	125.8	1258.0	34.00	25.7	6.5	20.4%	256.3	167.2
40	3	Caeser	29.0	142.7	1427.0	43.50	32.4	7.3	17.9%	255.3	151.8
56	4	Jitka	36.0	132.9	1329.0	36.90	27.6	6.4	18.7%	248.7	301.3
15	1	Diane	36.0	110.1	1101.0	28.80	22.1	5.9	22.2%	244.2	187.8
13	1	Elise	38.0	141.5	1415.0	38.50	29.2	6.2	17.2%	243.0	174.9
30	2	Arriane	37.0	135.7	1357.0	37.40	28.2	6.3	17.9%	242.9	208.3
48	3	Jitka	31.0	131.7	1317.0	33.80	24.6	5.7	18.2%	239.1	217.3
27	2	Hermes	37.0	103.1	1031.0	28.40	21.5	5.9	22.8%	234.9	192.9
4	1	Opaline	38.0	118.5	1185.0	33.80	26.2	6.1	19.4%	230.2	131.2
7	1	Electra	35.0	110.3	1103.0	30.90	22.9	5.9	20.8%	230.0	138.9
47	3	Escalina	30.5	119.4	1194.0	29.60	22.5	5.2	19.2%	229.1	182.6
9	1	Hermes	32.0	105.7	1057.0	33.50	24.6	6.4	20.5%	216.8	126.1
49	4	Laura	36.0	125.8	1258.0	35.90	26.4	5.7	17.1%	215.3	190.4
60	4	Alba	32.0	138.5	1385.0	35.40	26.4	5.1	15.5%	214.7	259.8
52	4	Caeser	36.0	121.7	1217.0	39.20	29.1	6.4	17.5%	212.8	187.8
39	3	Opaline	31.5	116.8	1168.0	36.00	26.7	6.0	18.0%	209.8	146.6
51	4	Ilona	34.0	114.1	1141.0	30.30	22.6	5.1	18.1%	206.5	230.3
50	4	Evelin	34.0	112.5	1125.0	31.90	24.3	5.4	18.2%	205.2	241.8
61	4	Escalina	35.0	115.7	1157.0	30.40	22.7	5.0	17.7%	205.1	253.6
34	3	Elise	35.0	104.5	1045.0	29.60	22.6	5.2	19.1%	199.8	164.6

Plot	Rep	Variety	Straw Length (cm) /a	Unretted 1m ² wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted Bundle wt (g)	Fiber wt (g)	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
37	3	Evelin	28.0	114.8	1148.0	31.20	23.0	5.0	17.4%	199.3	203.2
10	1	Caesar	32.0	120.9	1209.0	37.70	27.4	5.7	16.2%	195.8	102.9
42	3	Viking	30.0	137.5	1375.0	32.50	24.9	4.2	14.2%	195.8	338.6
2	1	Arriane	35.0	122.3	1223.0	31.70	23.7	4.7	15.9%	194.9	118.3
59	4	Arriane	33.0	110.1	1101.0	30.80	22.7	5.0	17.5%	192.5	262.4
12	1	Jitka	30.5	100.9	1009.0	27.60	20.1	4.7	18.7%	188.2	174.9
41	3	Ilona	29.0	109.2	1092.0	30.40	22.3	4.8	17.1%	186.5	159.5
53	4	Viking	26.0	128.5	1285.0	31.40	23.4	4.1	14.1%	181.7	312.4
19	2	Escalina	30.0	98.3	983.0	26.00	19.1	4.3	18.2%	179.1	113.2
5	1	Laura	31.0	107.4	1074.0	29.10	21.0	4.4	16.5%	177.7	128.6
8	1	Evelin	32.0	100.8	1008.0	30.50	22.2	4.9	17.5%	176.4	105.5
38	3	Arriane	33.0	109.8	1098.0	30.00	19.9	4.3	15.6%	171.7	187.0
22	2	Jitka	31.0	96.3	963.0	30.60	22.3	4.9	17.5%	168.5	113.2
14	1	Ilona	34.5	125.1	1251.0	37.20	27.5	4.7	13.4%	168.0	187.8
1	1	Alba	21.0	124.0	1240.0	30.70	22.2	3.6	12.8%	158.9	48.9
25	2	Opaline	32.0	87.7	877.0	29.00	21.4	4.7	17.6%	154.4	87.5
3	1	Viking	27.0	108.2	1082.0	24.00	17.6	3.1	14.2%	153.9	138.9
26	2	Elise	31.0	99.8	998.0	26.10	18.8	3.6	15.0%	149.7	118.3
32	2	Viking	29.0	106.9	1069.0	26.80	20.1	3.4	13.9%	148.4	215.3
21	2	Alba	28.0	98.4	984.0	28.10	20.2	3.8	14.8%	146.1	144.1
64	4	Elise	32.0	98.6	986.0	27.20	19.6	3.6	14.3%	141.4	182.6
18	2	Ilona	32.0	91.6	916.0	24.40	18.6	3.4	15.3%	140.3	167.2
35	3	Alba	31.0	84.7	847.0	25.40	18.2	3.8	16.5%	139.3	133.8
23	2	Laura	29.0	84.7	847.0	25.60	18.1	3.6	15.8%	133.7	113.2
11	1	Escalina	33.0	86.3	863.0	31.00	22.6	4.4	15.3%	132.3	162.1
16	1	Valour	29.0	106.6	575.6	29.20	21.5	3.2	12.0%	69.2	285.3
58	4	Flanders	21.0	124.0	669.6	30.70	16.7	2.9	10.2%	68.4	298.1
36	3	Flanders	28.0	107.3	579.4	26.20	19.2	2.6	10.9%	63.3	154.4
63	4	Valour	26.0	93.2	503.3	24.60	18.5	2.5	11.3%	56.9	287.1
6	1	Flanders	19.0	73.3	395.8	23.40	16.7	2.8	13.5%	53.3	131.2
20	2	Valour	23.0	75.2	406.1	21.70	16.0	2.4	12.4%	50.2	115.8
17	2	Flanders	22.0	70.1	378.5	20.40	14.7	2.4	13.3%	50.2	38.6
33	3	Valour	28.0	77.0	415.8	20.10	14.8	1.6	8.9%	37.2	48.9

Plot	Rep	Variety	Straw Length (cm) /a	Unretted 1 m ² wt (g) /b	Salvageable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted Bundle wt (g)	Fiber wt (g)	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
Notes: Plots were 4ft X 23ft = 92 ft ² = 8.6 m ² = 0.00086ha = 0.000348acre. 39.368 bushels per tonne, 1000kg per tonne, 4047 m ² per acre. Plots were seeded May 24/01 at 40 kg/ha a/ Straw length is approximately average from ground level b/ All 1 m ² weights have roots and seed attached and are double the 1/2m ² weights c/ Based on average amount of straw that is usable when plants are short and grown under stressed conditions times the unretted 1/2m ² total plant weight times 2 times 10,000 m ² per hectare divided by 1,000g per kg d/ Fiber Yield is based on Fiber % of Unretted straw times Salvageable Straw Weight											

Table A-3 - Variety Trials Sorted on Fiber %

Plot	Rep	Variety	Straw Length (cm) /a	Unretted 1m ² wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted Bundle wt (g)	Fiber wt (g)	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
31	2	Electra	46.0	119.8	1198.0	30.90	24.4	7.4	26.0%	311.1	220.8
29	2	Evelin	39.0	136.7	1367.0	31.70	24.6	6.8	23.1%	316.2	220.3
27	2	Hermes	37.0	103.1	1031.0	28.40	21.5	5.9	22.8%	234.9	192.9
15	1	Diane	36.0	110.1	1101.0	28.80	22.1	5.9	22.2%	244.2	187.8
28	2	Caeser	38.0	126.6	1266.0	38.60	30.5	7.9	21.9%	277.0	159.5
44	3	Diane	38.0	153.6	1536.0	40.80	32.4	8.4	21.8%	335.1	262.9
45	3	Hermes	39.0	137.4	1374.0	38.30	29.2	7.7	21.3%	293.1	292.3
54	4	Hermes	33.0	129.3	1293.0	36.50	26.3	7.3	21.3%	275.2	198.1
43	3	Electra	44.0	136.2	1362.0	38.90	30.2	7.7	21.1%	287.3	313.9
7	1	Electra	35.0	110.3	1103.0	30.90	22.9	5.9	20.8%	230.0	138.9
55	4	Diane	40.0	141.5	1415.0	35.40	26.6	6.8	20.6%	291.6	246.8
9	1	Hermes	32.0	105.7	1057.0	33.50	24.6	6.4	20.5%	216.8	126.1
62	4	Opaline	37.0	125.8	1258.0	34.00	25.7	6.5	20.4%	256.3	167.2
57	4	Electra	44.0	150.2	1502.0	40.20	31.7	7.6	20.2%	303.6	324.6
24	2	Diane	34.0	129.1	1291.0	32.90	24.3	6.1	19.9%	257.4	149.2
4	1	Opaline	38.0	118.5	1185.0	33.80	26.2	6.1	19.4%	230.2	131.2
46	3	Laura	39.0	140.2	1402.0	38.10	29.0	6.9	19.2%	269.5	240.0
47	3	Escalina	30.5	119.4	1194.0	29.60	22.5	5.2	19.2%	229.1	182.6
34	3	Elise	35.0	104.5	1045.0	29.60	22.6	5.2	19.1%	199.8	164.6
56	4	Jitka	36.0	132.9	1329.0	36.90	27.6	6.4	18.7%	248.7	301.3
12	1	Jitka	30.5	100.9	1009.0	27.60	20.1	4.7	18.7%	188.2	174.9
50	4	Evelin	34.0	112.5	1125.0	31.90	24.3	5.4	18.2%	205.2	241.8
19	2	Escalina	30.0	98.3	983.0	26.00	19.1	4.3	18.2%	179.1	113.2
48	3	Jitka	31.0	131.7	1317.0	33.80	24.6	5.7	18.2%	239.1	217.3
51	4	Ilona	34.0	114.1	1141.0	30.30	22.6	5.1	18.1%	206.5	230.3
39	3	Opaline	31.5	116.8	1168.0	36.00	26.7	6.0	18.0%	209.8	146.6
30	2	Arriane	37.0	135.7	1357.0	37.40	28.2	6.3	17.9%	242.9	208.3
40	3	Caeser	29.0	142.7	1427.0	43.50	32.4	7.3	17.9%	255.3	151.8
61	4	Escalina	35.0	115.7	1157.0	30.40	22.7	5.0	17.7%	205.1	253.6
25	2	Opaline	32.0	87.7	877.0	29.00	21.4	4.7	17.6%	154.4	87.5
8	1	Evelin	32.0	100.8	1008.0	30.50	22.2	4.9	17.5%	176.4	105.5

Plot	Rep	Variety	Straw Length (cm) /a	Unretted 1m ² wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted Bundle wt (g)	Fiber wt (g)	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
22	2	Jitka	31.0	96.3	963.0	30.60	22.3	4.9	17.5%	168.5	113.2
52	4	Caesar	36.0	121.7	1217.0	39.20	29.1	6.4	17.5%	212.8	187.8
59	4	Ariane	33.0	110.1	1101.0	30.80	22.7	5.0	17.5%	192.5	262.4
37	3	Evelin	28.0	114.8	1148.0	31.20	23.0	5.0	17.4%	199.3	203.2
13	1	Elise	38.0	141.5	1415.0	38.50	29.2	6.2	17.2%	243.0	174.9
49	4	Laura	36.0	125.8	1258.0	35.90	26.4	5.7	17.1%	215.3	190.4
41	3	Ilona	29.0	109.2	1092.0	30.40	22.3	4.8	17.1%	186.5	159.5
5	1	Laura	31.0	107.4	1074.0	29.10	21.0	4.4	16.5%	177.7	128.6
35	3	Alba	31.0	84.7	847.0	25.40	18.2	3.8	16.5%	139.3	133.8
10	1	Caesar	32.0	120.9	1209.0	37.70	27.4	5.7	16.2%	195.8	102.9
2	1	Ariane	35.0	122.3	1223.0	31.70	23.7	4.7	15.9%	194.9	118.3
23	2	Laura	29.0	84.7	847.0	25.60	18.1	3.6	15.8%	133.7	113.2
38	3	Ariane	33.0	109.8	1098.0	30.00	19.9	4.3	15.6%	171.7	187.0
60	4	Alba	32.0	138.5	1385.0	35.40	26.4	5.1	15.5%	214.7	259.8
11	1	Escalina	33.0	86.3	863.0	31.00	22.6	4.4	15.3%	132.3	162.1
18	2	Ilona	32.0	91.6	916.0	24.40	18.6	3.4	15.3%	140.3	167.2
26	2	Elise	31.0	99.8	998.0	26.10	18.8	3.6	15.0%	149.7	118.3
21	2	Alba	28.0	98.4	984.0	28.10	20.2	3.8	14.8%	146.1	144.1
64	4	Elise	32.0	98.6	986.0	27.20	19.6	3.6	14.3%	141.4	182.6
42	3	Viking	30.0	137.5	1375.0	32.50	24.9	4.2	14.2%	195.8	338.6
3	1	Viking	27.0	108.2	1082.0	24.00	17.6	3.1	14.2%	153.9	138.9
53	4	Viking	26.0	128.5	1285.0	31.40	23.4	4.1	14.1%	181.7	312.4
32	2	Viking	29.0	106.9	1069.0	26.80	20.1	3.4	13.9%	148.4	215.3
6	1	Flanders	19.0	73.3	395.8	23.40	16.7	2.8	13.5%	53.3	131.2
14	1	Ilona	34.5	125.1	1251.0	37.20	27.5	4.7	13.4%	168.0	187.8
17	2	Flanders	22.0	70.1	378.5	20.40	14.7	2.4	13.3%	50.2	38.6
1	1	Alba	21.0	124.0	1240.0	30.70	22.2	3.6	12.8%	158.9	48.9
20	2	Valour	23.0	75.2	406.1	21.70	16.0	2.4	12.4%	50.2	115.8
16	1	Valour	29.0	106.6	575.6	29.20	21.5	3.2	12.0%	69.2	285.3
63	4	Valour	26.0	93.2	503.3	24.60	18.5	2.5	11.3%	56.9	287.1
36	3	Flanders	28.0	107.3	579.4	26.20	19.2	2.6	10.9%	63.3	154.4
58	4	Flanders	21.0	124.0	669.6	30.70	16.7	2.9	10.2%	68.4	298.1
33	3	Valour	28.0	77.0	415.8	20.10	14.8	1.6	8.9%	37.2	48.9

Plot	Rep	Variety	Straw Length (cm) /a	Unretted 1m ² wt (g) /b	Salvageable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted Bundle wt (g)	Fiber wt (g)	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
Notes: Plots were 4ft X 23ft = 92 ft ² = 8.6 m ² = 0.00086ha = 0.000348acre. 39.368 bushels per tonne, 1000kg per tonne, 4047 m ² per acre. Plots were seeded May 24/01 at 40 kg/ha a/ Straw length is approximately average from ground level b/ All 1m ² weights have roots and seed attached and are double the ½m ² weights c/ Based on average amount of straw that is usable when plants are short and grown under stressed conditions times the unretted ½m ² total plant weight times 2 times 10,000 m ² per hectare divided by 1,000g per kg d/ Fiber Yield is based on Fiber % of Unretted straw times Salvageable Straw Weight											

Table A-4 - Results of Variety Trials Sorted on Straw Length

Plot	Rep	Variety	Straw Length (cm) /a	Unretted 1 m ² wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted Bundle wt (g)	Fiber wt (g)	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
31	2	Electra	46.0	119.8	1198.0	30.90	24.4	7.4	26.0%	311.1	220.8
57	4	Electra	44.0	150.2	1502.0	40.20	31.7	7.6	20.2%	303.6	324.6
43	3	Electra	44.0	136.2	1362.0	38.90	30.2	7.7	21.1%	287.3	313.9
55	4	Diane	40.0	141.5	1415.0	35.40	26.6	6.8	20.6%	291.6	246.8
29	2	Evelin	39.0	136.7	1367.0	31.70	24.6	6.8	23.1%	316.2	220.3
45	3	Hermes	39.0	137.4	1374.0	38.30	29.2	7.7	21.3%	293.1	292.3
46	3	Laura	39.0	140.2	1402.0	38.10	29.0	6.9	19.2%	269.5	240.0
44	3	Diane	38.0	153.6	1536.0	40.80	32.4	8.4	21.8%	335.1	262.9
28	2	Caeser	38.0	126.6	1266.0	38.60	30.5	7.9	21.9%	277.0	159.5
13	1	Elise	38.0	141.5	1415.0	38.50	29.2	6.2	17.2%	243.0	174.9
4	1	Opaline	38.0	118.5	1185.0	33.80	26.2	6.1	19.4%	230.2	131.2
62	4	Opaline	37.0	125.8	1258.0	34.00	25.7	6.5	20.4%	256.3	167.2
30	2	Arriane	37.0	135.7	1357.0	37.40	28.2	6.3	17.9%	242.9	208.3
27	2	Hermes	37.0	103.1	1031.0	28.40	21.5	5.9	22.8%	234.9	192.9
56	4	Jitka	36.0	132.9	1329.0	36.90	27.6	6.4	18.7%	248.7	301.3
15	1	Diane	36.0	110.1	1101.0	28.80	22.1	5.9	22.2%	244.2	187.8
49	4	Laura	36.0	125.8	1258.0	35.90	26.4	5.7	17.1%	215.3	190.4
52	4	Caeser	36.0	121.7	1217.0	39.20	29.1	6.4	17.5%	212.8	187.8
7	1	Electra	35.0	110.3	1103.0	30.90	22.9	5.9	20.8%	230.0	138.9
61	4	Escalina	35.0	115.7	1157.0	30.40	22.7	5.0	17.7%	205.1	253.6
34	3	Elise	35.0	104.5	1045.0	29.60	22.6	5.2	19.1%	199.8	164.6
2	1	Arriane	35.0	122.3	1223.0	31.70	23.7	4.7	15.9%	194.9	118.3
14	1	Ilona	34.5	125.1	1251.0	37.20	27.5	4.7	13.4%	168.0	187.8
24	2	Diane	34.0	129.1	1291.0	32.90	24.3	6.1	19.9%	257.4	149.2
51	4	Ilona	34.0	114.1	1141.0	30.30	22.6	5.1	18.1%	206.5	230.3
50	4	Evelin	34.0	112.5	1125.0	31.90	24.3	5.4	18.2%	205.2	241.8
54	4	Hermes	33.0	129.3	1293.0	36.50	26.3	7.3	21.3%	275.2	198.1
59	4	Arriane	33.0	110.1	1101.0	30.80	22.7	5.0	17.5%	192.5	262.4
38	3	Arriane	33.0	109.8	1098.0	30.00	19.9	4.3	15.6%	171.7	187.0
11	1	Escalina	33.0	86.3	863.0	31.00	22.6	4.4	15.3%	132.3	162.1
9	1	Hermes	32.0	105.7	1057.0	33.50	24.6	6.4	20.5%	216.8	126.1

			Straw Length (cm) /a	Unretted 1m ² wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted Bundle wt (g)	Fiber wt (g)	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
Plot	Rep	Variety									
60	4	Alba	32.0	138.5	1385.0	35.40	26.4	5.1	15.5%	214.7	259.8
10	1	Caeser	32.0	120.9	1209.0	37.70	27.4	5.7	16.2%	195.8	102.9
8	1	Evelin	32.0	100.8	1008.0	30.50	22.2	4.9	17.5%	176.4	105.5
25	2	Opaline	32.0	87.7	877.0	29.00	21.4	4.7	17.6%	154.4	87.5
64	4	Elise	32.0	98.6	986.0	27.20	19.6	3.6	14.3%	141.4	182.6
18	2	Ilona	32.0	91.6	916.0	24.40	18.6	3.4	15.3%	140.3	167.2
39	3	Opaline	31.5	116.8	1168.0	36.00	26.7	6.0	18.0%	209.8	146.6
48	3	Jitka	31.0	131.7	1317.0	33.80	24.6	5.7	18.2%	239.1	217.3
5	1	Laura	31.0	107.4	1074.0	29.10	21.0	4.4	16.5%	177.7	128.6
22	2	Jitka	31.0	96.3	963.0	30.60	22.3	4.9	17.5%	168.5	113.2
26	2	Elise	31.0	99.8	998.0	26.10	18.8	3.6	15.0%	149.7	118.3
35	3	Alba	31.0	84.7	847.0	25.40	18.2	3.8	16.5%	139.3	133.8
47	3	Escalina	30.5	119.4	1194.0	29.60	22.5	5.2	19.2%	229.1	182.6
12	1	Jitka	30.5	100.9	1009.0	27.60	20.1	4.7	18.7%	188.2	174.9
42	3	Viking	30.0	137.5	1375.0	32.50	24.9	4.2	14.2%	195.8	338.6
19	2	Escalina	30.0	98.3	983.0	26.00	19.1	4.3	18.2%	179.1	113.2
40	3	Caeser	29.0	142.7	1427.0	43.50	32.4	7.3	17.9%	255.3	151.8
41	3	Ilona	29.0	109.2	1092.0	30.40	22.3	4.8	17.1%	186.5	159.5
32	2	Viking	29.0	106.9	1069.0	26.80	20.1	3.4	13.9%	148.4	215.3
23	2	Laura	29.0	84.7	847.0	25.60	18.1	3.6	15.8%	133.7	113.2
16	1	Valour	29.0	106.6	575.6	29.20	21.5	3.2	12.0%	69.2	285.3
37	3	Evelin	28.0	114.8	1148.0	31.20	23.0	5.0	17.4%	199.3	203.2
21	2	Alba	28.0	98.4	984.0	28.10	20.2	3.8	14.8%	146.1	144.1
36	3	Flanders	28.0	107.3	579.4	26.20	19.2	2.6	10.9%	63.3	154.4
33	3	Valour	28.0	77.0	415.8	20.10	14.8	1.6	8.9%	37.2	48.9
3	1	Viking	27.0	108.2	1082.0	24.00	17.6	3.1	14.2%	153.9	138.9
53	4	Viking	26.0	128.5	1285.0	31.40	23.4	4.1	14.1%	181.7	312.4
63	4	Valour	26.0	93.2	503.3	24.60	18.5	2.5	11.3%	56.9	287.1
20	2	Valour	23.0	75.2	406.1	21.70	16.0	2.4	12.4%	50.2	115.8
17	2	Flanders	22.0	70.1	378.5	20.40	14.7	2.4	13.3%	50.2	38.6
1	1	Alba	21.0	124.0	1240.0	30.70	22.2	3.6	12.8%	158.9	48.9
58	4	Flanders	21.0	124.0	669.6	30.70	16.7	2.9	10.2%	68.4	298.1
6	1	Flanders	19.0	73.3	395.8	23.40	16.7	2.8	13.5%	53.3	131.2

Plot	Rep	Variety	Straw Length (cm) /a	Unretted 1m ² wt (g) /b	Salvageable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted Bundle wt (g)	Fiber wt (g)	Fiber % of Unretted Straw	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
Notes: Plots were 4ft X 23ft = 92 ft ² = 8.6 m ² = 0.00086ha = 0.000348acre. 39,368 bushels per tonne, 1000kg per tonne, 4047 m ² per acre. Plots were seeded May 24/01 at 40 kg/ha a/ Straw length is approximately average from ground level b/ All 1m ² weights have roots and seed attached and are double the ½m ² weights c/ Based on average amount of straw that is usable when plants are short and grown under stressed conditions times the unretted ½m ² total plant weight times 2 times 10,000 m ² per hectare divided by 1,000g per kg d/ Fiber Yield is based on Fiber % of Unretted straw times Salvageable Straw Weight											

Table A-5 - Results of Seeding Rate Trial Sorted on Fiber Yield

Plot	Rep	Variety	Seeding Method	Seeding Rate (kg/ha)	Straw Length (cm) /a	$\frac{1}{2}m^2$ wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted wt (g)	Fiber wt (g)	Seed Wt (g)	Fiber % of Unretted Fiber	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
	3	Hermes	Row	80	39.5	118.7	2374.0	28.2	22.0	5.7	0.261	21.8%	516.5	329.3
	3	Hermes	Row	40	48.0	117.1	2342.0	27.9	22.3	5.4	0.201	21.3%	497.9	253.0
	3	Hermes	Row	120	39.5	105.3	2106.0	26.4	21.1	4.9	0.198	20.4%	430.0	250.0
	4	Hermes	Row	120	38.0	90.2	1804.0	29.1	22.2	5.5	0.204	21.1%	380.2	257.3
	2	Hermes	Row	80	42.0	98.6	1972.0	27.5	21.0	4.4	0.182	17.5%	344.3	229.3
	2	Flanders	Row	120	34.0	139.0	2780.0	34.7	25.7	3.6	0.076	11.2%	310.8	95.9
	3	Flanders	Row	80	28.0	124.8	2496.0	25.2	18.5	2.7	0.405	11.6%	290.5	510.5
	3	Flanders	Row	120	25.0	98.9	1978.0	25.8	18.9	3.3	0.138	14.2%	281.4	174.2
	2	Hermes	Row	120	33.0	82.6	1652.0	26.8	19.9	4.1	0.110	16.8%	277.6	138.9
	4	Hermes	Row	40	43.0	86.6	1732.0	23.1	17.6	3.2	0.122	15.4%	266.5	154.0
	1	Hermes	Row	40	32.5	78.3	1566.0	22.6	16.7	3.1	0.104	15.3%	239.1	131.3
	1	Hermes	Row	80	34.0	55.0	1100.0	19.5	14.7	3.6	0.142	20.9%	230.2	179.3
	3	Flanders	Row	40	29.0	95.9	1918.0	20.3	15.3	2.0	0.218	11.2%	214.3	275.0
	1	Hermes	Row	120	37.0	58.8	1176.0	21.9	16.0	3.4	0.128	17.4%	205.0	161.6
	4	Flanders	Row	40	30.0	70.0	1400.0	16.5	12.3	2.0	0.339	14.0%	195.8	427.5
	4	Flanders	Row	80	27.5	48.9	978.0	14.0	10.6	2.0	0.102	16.7%	163.0	128.8
	1	Flanders	Row	80	28.0	70.6	1412.0	18.9	13.6	1.9	0.154	11.5%	162.6	194.4
	2	Flanders	Row	80	26.0	88.8	1776.0	25.3	18.1	2.0	0.142	8.8%	155.8	179.3
	2	Flanders	Row	40	28.5	87.5	1750.0	24.4	17.5	1.9	0.056	8.6%	151.1	70.7
	1	Flanders	Row	120	24.0	70.0	1400.0	18.4	13.4	1.7	0.138	10.5%	146.9	174.2
	1	Flanders	Row	40	26.0	81.5	1630.0	20.6	14.6	1.6	0.208	8.8%	143.3	261.8
	2	Hermes	Row	40	34.0	44.9	898.0	15.7	11.4	1.8	0.140	13.3%	119.7	176.7
	4	Hermes	Row	80	30.0	18.5	370.0	10.4	7.1	1.3	0.002	16.7%	61.7	2.5
	4	Flanders	Row	120	24.0	25.9	518.0	10.7	7.5	0.8	0.034	10.0%	51.8	42.9

'lot	Rep	Variety	Seeding Method	Seeding Rate (kg/ha)	Straw Length (cm) /a	1/2m ² wt (g) /b	Salvageable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted wt (g)	Fiber wt (g)	Seed Wt (g)	Fiber % of Unretted Fiber	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
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Notes:

lots were 4ft X 23ft = 92 ft² = 8.6 m² = 0.00086ha = 0.000348acre.
 9.368 bushels per tonne, 1000kg per tonne, 4047 m² per acre.
 lots were seeded May 24/01 at 40 kg/ha

/ Straw length is approximately average from ground level

/ All 1 m² weights have roots and seed attached and are double the 1/2m² weights

/ Based on average amount of straw that is usable when plants are short and grown under stressed conditions times the unretted

1/2m² total plant weight times 2 times 10,000 m² per hectare divided by 1,000g per kg

/ Fiber Yield is based on Fiber % of Unretted straw times Salvageable Straw Weight

Table A-6 - Results of Seeding Rate Trial Sorted on Seed Yield

Lot	Rep	Variety	Seeding Method	Seeding Rate (kg/ha)	Straw Length (cm) /a	$\frac{1}{2}m^2$ wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted wt (g)	Fiber wt (g)	Seed Wt (g)	Fiber % of Unretted Fiber	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
3	3	Flanders	Row	80	28.0	124.8	2496.0	25.2	18.5	2.7	0.405	11.6%	290.5	510.5
6	4	Flanders	Row	40	30.0	70.0	1400.0	16.5	12.3	2.0	0.339	14.0%	195.8	427.5
4	3	Hermes	Row	80	39.5	118.7	2374.0	28.2	22.0	5.7	0.261	21.8%	516.5	329.3
9	3	Flanders	Row	40	29.0	95.9	1918.0	20.3	15.3	2.0	0.218	11.2%	214.3	275.0
2	1	Flanders	Row	40	26.0	81.5	1630.0	20.6	14.6	1.6	0.208	8.8%	143.3	261.8
8	4	Hermes	Row	120	38.0	90.2	1804.0	29.1	22.2	5.5	0.204	21.1%	380.2	257.3
2	3	Hermes	Row	40	48.0	117.1	2342.0	27.9	22.3	5.4	0.201	21.3%	497.9	253.0
1	3	Hermes	Row	120	39.5	105.3	2106.0	26.4	21.1	4.9	0.198	20.4%	430.0	250.0
9	2	Hermes	Row	80	42.0	98.6	1972.0	27.5	21.0	4.4	0.182	17.5%	344.3	229.3
	1	Flanders	Row	80	28.0	70.6	1412.0	18.9	13.6	1.9	0.154	11.5%	162.6	194.4
	1	Hermes	Row	80	34.0	55.0	1100.0	19.5	14.7	3.6	0.142	20.9%	230.2	179.3
6	2	Flanders	Row	80	26.0	88.8	1776.0	25.3	18.1	2.0	0.142	8.8%	155.8	179.3
4	2	Hermes	Row	40	34.0	44.9	898.0	15.7	11.4	1.8	0.140	13.3%	119.7	176.7
8	2	Hermes	Broadcast	40							0.140			176.7
7	3	Flanders	Row	120	25.0	98.9	1978.0	25.8	18.9	3.3	0.138	14.2%	281.4	174.2
	1	Flanders	Row	120	24.0	70.0	1400.0	18.4	13.4	1.7	0.138	10.5%	146.9	174.2
	1	Hermes	Row	120	37.0	58.8	1176.0	21.9	16.0	3.4	0.128	17.4%	205.0	161.6
2	4	Hermes	Row	40	43.0	86.6	1732.0	23.1	17.6	3.2	0.122	15.4%	266.5	154.0
5	4	Flanders	Broadcast	40							0.122			154.0
7	2	Hermes	Row	120	33.0	82.6	1652.0	26.8	19.9	4.1	0.110	16.8%	277.6	138.9
0	3	Flanders	Broadcast	80							0.106			133.8
0	1	Hermes	Row	40	32.5	78.3	1566.0	22.6	16.7	3.1	0.104	15.3%	239.1	131.3
3	2	Flanders	Broadcast	120							0.104			131.3
8	4	Flanders	Row	80	27.5	48.9	978.0	14.0	10.6	2.0	0.102	16.7%	163.0	128.8
	1	Flanders	Broadcast	80							0.100			126.2
7	4	Hermes	Broadcast	80							0.100			126.2
0	2	Flanders	Row	120	34.0	139.0	2780.0	34.7	25.7	3.6	0.076	11.2%	310.8	95.9
3	4	Flanders	Broadcast	120							0.074			93.4
4	4	Hermes	Broadcast	40							0.070			88.4
1		Hermes	Broadcast	120							0.064			80.8
5	3	Hermes	Broadcast	120							0.062			78.3

'lot	Rep	Variety	Seeding Method	Seeding Rate (kg/ha)	Straw Length (cm) /a	1/2m ² wt (g) /b	Salvageable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted wt (g)	Fiber wt (g)	Fiber Seed Wt (g)	Fiber % of Unretted Fiber	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
4	2	Flanders	Row	40	28.5	87.5	1750.0	24.4	17.5	1.9	0.056	8.6%	151.1	1.1
7	4	Flanders	Broadcast	80							0.050			0.9
5	3	Hermes	Broadcast	40							0.048			0.9
1	2	Flanders	Broadcast	80							0.036			0.7
9	4	Flanders	Row	120	24.0	25.9	518.0	10.7	7.5	0.8	0.034	10.0%	51.8	0.6
	1	Hermes	Broadcast	80							0.030			0.6
8	3	Flanders	Broadcast	40							0.030			0.6
6	3	Flanders	Broadcast	120							0.026			0.5
1	1	Hermes	Broadcast	40							0.024			0.5
5	3	Hermes	Broadcast	80							0.022			0.4
	1	Flanders	Broadcast	40							0.018			0.3
	1	Flanders	Broadcast	120							0.014			0.3
2	2	Flanders	Broadcast	40							0.014			0.3
3	2	Hermes	Broadcast	120							0.014			0.3
0	4	Hermes	Broadcast	120							0.006			0.1
5	2	Hermes	Broadcast	80							0.004			0.1
1	4	Hermes	Row	80	30.0	18.5	370.0	10.4	7.1	1.3	0.002	16.7%	61.7	0.0

Notes:

lots were 4ft X 23ft = 92 ft² = 8.6 m² = 0.00086ha = 0.000348acre.
9.368 bushels per tonne, 1000kg per tonne, 4047 m² per acre.

/ Straw length is approximately average from ground level

/ All 1m² weights have roots and seed attached and are double the 1/2m² weights

/ Based on average amount of straw that is usable when plants are short and grown under stressed conditions times the unretted

1/2m² total plant weight times 2 times 10,000 m² per hectare divided by 1,000g per kg

/ Fiber Yield is based on Fiber % of Unretted straw times Salvageable Straw Weight

Table A-7 - Results of Seeding Rate Trials Sorted on Fiber %

lot	Rep	Variety	Seeding Method	Seeding Rate (kg/ha)	Straw Length (cm) /a	$\frac{1}{2}m^2$ wt (g) /b	Salvagable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted wt (g)	Fiber wt (g)	Seed Wt (g)	Fiber % of Unretted Fiber	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
1	3	Hermes	Row	80	39.5	118.7	2374.0	28.2	22.0	5.7	0.261	21.8%	516.5	329.3
2	3	Hermes	Row	40	48.0	117.1	2342.0	27.9	22.3	5.4	0.201	21.3%	497.9	253.0
3	4	Hermes	Row	120	38.0	90.2	1804.0	29.1	22.2	5.5	0.204	21.1%	380.2	257.3
4	1	Hermes	Row	80	34.0	55.0	1100.0	19.5	14.7	3.6	0.142	20.9%	230.2	179.3
5	3	Hermes	Row	120	39.5	105.3	2106.0	26.4	21.1	4.9	0.198	20.4%	430.0	250.0
6	2	Hermes	Row	80	42.0	98.6	1972.0	27.5	21.0	4.4	0.182	17.5%	344.3	229.3
7	1	Hermes	Row	120	37.0	58.8	1176.0	21.9	16.0	3.4	0.128	17.4%	205.0	161.6
8	2	Hermes	Row	120	33.0	82.6	1652.0	26.8	19.9	4.1	0.110	16.8%	277.6	138.9
9	4	Flanders	Row	80	27.5	48.9	978.0	14.0	10.6	2.0	0.102	16.7%	163.0	128.8
10	4	Hermes	Row	80	30.0	18.5	370.0	10.4	7.1	1.3	0.002	16.7%	61.7	2.5
11	2	Hermes	Row	40	43.0	86.6	1732.0	23.1	17.6	3.2	0.122	15.4%	266.5	154.0
12	1	Hermes	Row	40	32.5	78.3	1566.0	22.6	16.7	3.1	0.104	15.3%	239.1	131.3
13	3	Flanders	Row	120	25.0	98.9	1978.0	25.8	18.9	3.3	0.138	14.2%	281.4	174.2
14	4	Flanders	Row	40	30.0	70.0	1400.0	16.5	12.3	2.0	0.339	14.0%	195.8	427.5
15	2	Hermes	Row	40	34.0	44.9	898.0	15.7	11.4	1.8	0.140	13.3%	119.7	176.7
16	3	Flanders	Row	80	28.0	124.8	2496.0	25.2	18.5	2.7	0.405	11.6%	290.5	510.5
17	1	Flanders	Row	80	28.0	70.6	1412.0	18.9	13.6	1.9	0.154	11.5%	162.6	194.4
18	2	Flanders	Row	120	34.0	139.0	2780.0	34.7	25.7	3.6	0.076	11.2%	310.8	95.9
19	3	Flanders	Row	40	29.0	95.9	1918.0	20.3	15.3	2.0	0.218	11.2%	214.3	275.0
20	1	Flanders	Row	120	24.0	70.0	1400.0	18.4	13.4	1.7	0.138	10.5%	146.9	174.2
21	4	Flanders	Row	120	24.0	25.9	518.0	10.7	7.5	0.8	0.034	10.0%	51.8	42.9
22	1	Flanders	Row	40	26.0	81.5	1630.0	20.6	14.6	1.6	0.208	8.8%	143.3	261.8
23	2	Flanders	Row	80	26.0	88.8	1776.0	25.3	18.1	2.0	0.142	8.8%	155.8	179.3
24	2	Flanders	Row	40	28.5	87.5	1750.0	24.4	17.5	1.9	0.056	8.6%	151.1	70.7

'lot	Rep	Variety	Seeding Method	Seeding Rate (kg/ha)	Straw Length (cm) /a	1/2m ² wt (g) /b	Salvageable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted wt (g)	Fiber wt (g)	Seed Wt (g)	Fiber % of Unretted Fiber	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
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Notes:

lots were 4ft X 23ft = 92 ft² = 8.6 m² = 0.00086ha = 0.000348acre.
 9.368 bushels per tonne, 1000kg per tonne, 4047 m² per acre.

/ Straw length is approximately average from ground level

/ All 1m² weights have roots and seed attached and are double the 1/2m² weights

/ Based on average amount of straw that is usable when plants are short and grown under stressed conditions times the unretted 1/2m² total plant weight times 2 times 10,000 m² per hectare divided by 1,000g per kg

/ Fiber Yield is based on Fiber % of Unretted straw times Salvageable Straw Weight

Table A-8 Results of Seeding Rate Trials Sorted on Straw Length

Plot	Rep	Variety	Seeding Method	Seeding Rate (kg/ha)	Straw Length (cm) /a	½m ² wt (g) /b	Salvageable Straw Wt (kg/ha) /c	Dry Bundle wt (g)	Retted wt (g)	Fiber Seed wt (g)	Fiber % of Unretted Fiber	Fiber Yield (kg/ha) /d	Seed Yield (kg/ha)
32	3	Hermes	Row	40	48.0	117.1	2342.0	27.9	22.3	5.4	0.201	497.9	3.8
42	4	Hermes	Row	40	43.0	86.6	1732.0	23.1	17.6	3.2	0.122	266.5	2.3
19	2	Hermes	Row	80	42.0	98.6	1972.0	27.5	21.0	4.4	0.182	344.3	3.4
34	3	Hermes	Row	80	39.5	118.7	2374.0	28.2	22.0	5.7	0.261	516.5	4.9
31	3	Hermes	Row	120	39.5	105.3	2106.0	26.4	21.1	4.9	0.198	430.0	3.7
48	4	Hermes	Row	120	38.0	90.2	1804.0	29.1	22.2	5.5	0.204	380.2	3.8
2	1	Hermes	Row	120	37.0	58.8	1176.0	21.9	16.0	3.4	0.128	205.0	2.4
20	2	Flanders	Row	120	34.0	139.0	2780.0	34.7	25.7	3.6	0.076	310.8	1.4
4	1	Hermes	Row	80	34.0	55.0	1100.0	19.5	14.7	3.6	0.142	230.2	2.7
24	2	Hermes	Row	40	34.0	44.9	898.0	15.7	11.4	1.8	0.140	119.7	2.6
17	2	Hermes	Row	120	33.0	82.6	1652.0	26.8	19.9	4.1	0.110	277.6	2.1
10	1	Hermes	Row	40	32.5	78.3	1566.0	22.6	16.7	3.1	0.104	239.1	2.0
46	4	Flanders	Row	40	30.0	70.0	1400.0	16.5	12.3	2.0	0.339	195.8	6.4
41	4	Hermes	Row	80	30.0	18.5	370.0	10.4	7.1	1.3	0.002	61.7	0.0
29	3	Flanders	Row	40	29.0	95.9	1918.0	20.3	15.3	2.0	0.218	214.3	4.1
14	2	Flanders	Row	40	28.5	87.5	1750.0	24.4	17.5	1.9	0.056	151.1	1.1
33	3	Flanders	Row	80	28.0	124.8	2496.0	25.2	18.5	2.7	0.405	290.5	7.6
8	1	Flanders	Row	80	28.0	70.6	1412.0	18.9	13.6	1.9	0.154	162.6	2.9
38	4	Flanders	Row	80	27.5	48.9	978.0	14.0	10.6	2.0	0.102	163.0	1.9
16	2	Flanders	Row	80	26.0	88.8	1776.0	25.3	18.1	2.0	0.142	155.8	2.7
12	1	Flanders	Row	40	26.0	81.5	1630.0	20.6	14.6	1.6	0.208	143.3	3.9
27	3	Flanders	Row	120	25.0	98.9	1978.0	25.8	18.9	3.3	0.138	281.4	2.6
5	1	Flanders	Row	120	24.0	70.0	1400.0	18.4	13.4	1.7	0.138	146.9	2.6
39	4	Flanders	Row	120	24.0	25.9	518.0	10.7	7.5	0.8	0.034	51.8	0.6

Notes:

Plots were 4ft X 23ft = 92 ft² = 8.6 m² = 0.00086ha = 0.000348acre.
 39.368 bushels per tonne, 1000kg per tonne, 4047 m² per acre.

a/ Straw length is approximately average from ground level

b/ All 1m² weights have roots and seed attached and are double the ½m² weights

c/ Based on average amount of straw that is usable when plants are short and grown under stressed conditions times the unretted ½m² total plant weight times 2 times 10,000 m² per hectare divided by 1,000g per kg

d/ Fiber Yield is based on Fiber % of Unretted straw times Salvageable Straw Weight

Appendix B

Results of Regression Equations Used to Test Significant Relationships

Variety Trial Regressions

Equation B-1 -- Seed Yield as a Function of Variety

Regression Statistics	
Multiple R	0.47
R Square	0.22
Adjusted R Square	(0.02)
Standard Error	71.41
Observations	64.00

ANOVA				
	df	SS	MS	Significance F
Regression	15.00	68,686.58	4,579.11	0.90
Residual	48.00	244,783.53	5,099.66	0.57
Total	63.00	313,470.12		

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	194.00	35.71	5.43	0.00	122.21	265.79	122.21	265.79
Viking = 1	57.30	50.50	1.13	0.26	(44.23)	158.83	(44.23)	158.83
Electra = 1	55.55	50.50	1.10	0.28	(45.98)	157.08	(45.98)	157.08
Diane = 1	17.68	50.50	0.35	0.73	(83.85)	119.21	(83.85)	119.21
Hermes = 1	8.35	50.50	0.17	0.87	(93.18)	109.88	(93.18)	109.88
Jitka = 1	7.67	50.50	0.15	0.88	(93.86)	109.20	(93.86)	109.20
Evelin = 1	(1.28)	50.50	(0.03)	0.98	(102.81)	100.24	(102.81)	100.24
Ilona = 1	(7.79)	50.50	(0.15)	0.88	(109.32)	93.74	(109.32)	93.74
Valour = 1	(9.74)	50.50	(0.19)	0.85	(111.26)	91.79	(111.26)	91.79
Escalina = 1	(16.12)	50.50	(0.32)	0.75	(117.65)	85.41	(117.65)	85.41
Laura = 1	(25.95)	50.50	(0.51)	0.61	(127.48)	75.58	(127.48)	75.58
Elise = 1	(33.86)	50.50	(0.67)	0.51	(135.39)	67.67	(135.39)	67.67
Flanders = 1	(38.44)	50.50	(0.76)	0.45	(139.97)	63.08	(139.97)	63.08
Caesar = 1	(43.51)	50.50	(0.86)	0.39	(145.04)	58.02	(145.04)	58.02
Alba = 1	(47.38)	50.50	(0.94)	0.35	(148.91)	54.15	(148.91)	54.15
Opaline = 1	(60.87)	50.50	(1.21)	0.23	(162.40)	40.66	(162.40)	40.66

NOTE: Arriane was used as intercept

Equation B-2 - Straw Length as a Function of Variety

Regression Statistics	
Multiple R	0.84
R Square	0.70
Adjusted R Square	0.61
Standard Error	3.29
Observations	64.00

ANOVA

	df	SS	MS	F	Significance F
Regression	15.00	1,204.98	80.33	7.44	0.00
Residual	48.00	518.25	10.80		
Total	63.00	1,723.23			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	34.50	1.64	21.00	0.00	31.20	37.80	31.20	37.80
Electra = 1	7.75	2.32	3.34	0.00	3.08	12.42	3.08	12.42
Diane = 1	2.50	2.32	1.08	0.29	(2.17)	7.17	(2.17)	7.17
Hermes = 1	0.75	2.32	0.32	0.75	(3.92)	5.42	(3.92)	5.42
Opaline = 1	0.13	2.32	0.05	0.96	(4.55)	4.80	(4.55)	4.80
Elise = 1	(0.50)	2.32	(0.22)	0.83	(5.17)	4.17	(5.17)	4.17
Caesar = 1	(0.75)	2.32	(0.32)	0.75	(5.42)	3.92	(5.42)	3.92
Laura = 1	(0.75)	2.32	(0.32)	0.75	(5.42)	3.92	(5.42)	3.92
Evelin = 1	(1.25)	2.32	(0.54)	0.59	(5.92)	3.42	(5.92)	3.42
Ilona = 1	(2.12)	2.32	(0.91)	0.36	(6.80)	2.55	(6.80)	2.55
Jitka = 1	(2.37)	2.32	(1.02)	0.31	(7.05)	2.30	(7.05)	2.30
Escalina = 1	(2.37)	2.32	(1.02)	0.31	(7.05)	2.30	(7.05)	2.30
Alba = 1	(4.75)	2.32	(2.04)	0.05	(9.42)	(0.08)	(9.42)	(0.08)
Viking = 1	(6.50)	2.32	(2.80)	0.01	(11.17)	(1.83)	(11.17)	(1.83)
Valour = 1	(8.00)	2.32	(3.44)	0.00	(12.67)	(3.33)	(12.67)	(3.33)
Flanders = 1	(12.00)	2.32	(5.16)	0.00	(16.67)	(7.33)	(16.67)	(7.33)

Note: Ariane was used as intercept

Equation B-3 - Fiber % of Unretted Straw as a Function of Variety

Regression Statistics	
Multiple R	0.90
R Square	0.81
Adjusted R Square	0.75
Standard Error	0.02
Observations	64.00

ANOVA

	df	SS	MS	F	Significance F
Regression	15.00	0.06	0.00	13.31	0.00
Residual	48.00	0.01	0.00		
Total	63.00	0.07			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.17	0.01	19.51	0.00	0.15	0.18	0.15	0.18
Electra = 1	0.05	0.01	4.36	0.00	0.03	0.08	0.03	0.08
Hermes = 1	0.05	0.01	3.91	0.00	0.02	0.07	0.02	0.07
Diane = 1	0.04	0.01	3.63	0.00	0.02	0.07	0.02	0.07
Evelin = 1	0.02	0.01	1.91	0.06	(0.00)	0.05	(0.00)	0.05
Opaline = 1	0.02	0.01	1.74	0.09	(0.00)	0.05	(0.00)	0.05
Caesar = 1	0.02	0.01	1.34	0.19	(0.01)	0.04	(0.01)	0.04
Jitka = 1	0.02	0.01	1.25	0.22	(0.01)	0.04	(0.01)	0.04
Escalina = 1	0.01	0.01	0.73	0.47	(0.02)	0.03	(0.02)	0.03
Laura = 1	0.00	0.01	0.35	0.72	(0.02)	0.03	(0.02)	0.03
Elise = 1	(0.00)	0.01	(0.27)	0.79	(0.03)	0.02	(0.03)	0.02
Ilona = 1	(0.01)	0.01	(0.62)	0.54	(0.03)	0.02	(0.03)	0.02
Alba = 1	(0.02)	0.01	(1.51)	0.14	(0.04)	0.01	(0.04)	0.01
Viking = 1	(0.03)	0.01	(2.16)	0.04	(0.05)	(0.00)	(0.05)	(0.00)
Flanders = 1	(0.05)	0.01	(3.93)	0.00	(0.07)	(0.02)	(0.07)	(0.02)
Valour = 1	(0.06)	0.01	(4.60)	0.00	(0.08)	(0.03)	(0.08)	(0.03)

NOTE: Ariane was used as intercept

Equation B-4 - Fiber Yield as a Function of Variety

Regression Statistics	
Multiple R	0.88
R Square	0.78
Adjusted R Square	0.71
Standard Error	38.60
Observations	64.00

ANOVA

	df	SS	MS	F	Significance F
Regression	15.00	250,880.34	16,725.36	11.22	0.00
Residual	48.00	71,533.62	1,490.28		
Total	63.00	322,413.96			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	200.47	19.30	10.39	0.00	161.66	239.28	161.66	239.28
Electra = 1	82.51	27.30	3.02	0.00	27.63	137.40	27.63	137.40
Diane = 1	81.59	27.30	2.99	0.00	26.71	136.48	26.71	136.48
Hermes = 1	54.51	27.30	2.00	0.05	(0.37)	109.40	(0.37)	109.40
Caesar = 1	34.76	27.30	1.27	0.21	(20.12)	89.65	(20.12)	89.65
Evelin = 1	23.81	27.30	0.87	0.39	(31.08)	78.69	(31.08)	78.69
Opaline = 1	12.21	27.30	0.45	0.66	(42.67)	67.10	(42.67)	67.10
Jitka = 1	10.65	27.30	0.39	0.70	(44.24)	365.53	(44.24)	365.53
Laura = 1	(1.43)	27.30	(0.05)	0.96	(56.31)	43.46	(56.31)	43.46
Escalina = 1	(14.06)	27.30	(0.51)	0.61	(68.94)	40.83	(68.94)	40.83
Elise = 1	(16.99)	27.30	(0.62)	0.54	(71.88)	37.89	(71.88)	37.89
Ilona = 1	(25.15)	27.30	(0.92)	0.37	(80.03)	29.74	(80.03)	29.74
Viking = 1	(30.56)	27.30	(1.12)	0.27	(85.45)	24.32	(85.45)	24.32
Alba = 1	(35.73)	27.30	(1.31)	0.20	(90.62)	19.15	(90.62)	19.15
Flanders = 1	(141.69)	27.30	(5.19)	0.00	(196.57)	(86.80)	(196.57)	(86.80)
Valour = 1	(147.08)	27.30	(5.39)	0.00	(201.96)	(92.19)	(201.96)	(92.19)

Note: Ariane was used as intercept

Regressions - Seeding Rate X Method X Variety Trial

Equation B-5 - Seed Yield as a Function of Seeding Method

Regression Statistics	
Multiple R	0.61
R Square	0.37
Adjusted R Square	0.36
Standard Error	87.78
Observations	48.00

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00	211,326.77	211,326.77	27.42	-
Residual	46.00	354,458.96	7,705.63		
Total	47.00	565,785.73			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	67.22	1.20	22.84	0.00	25.00	30.00	25.00	30.00
Row = 1	132.70	25.34	5.24	0.00	81.70	183.71	81.70	183.71

NOTE: Broadcast seeding rate was used as intercept

Equation B-6 - Straw Length as a function of Variety

Regression Statistics	
Multiple R	0.78
R Square	0.61
Adjusted R Square	0.59
Standard Error	4.17
Observations	24.00

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00	605.01	605.01	34.78	0.00
Residual	22.00	382.73	17.40		
Total	23.00	987.74			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	27.50	1.20	22.84	0.00	25.00	30.00	25.00	30.00
Flanders = 1	(10.04)	1.70	(5.90)	0.00	(6.51)	(13.57)	(6.51)	(13.57)

NOTE: Hermes was used as intercept

Equation B-7 - Fiber % of Unretted Fiber as a Function of Variety

Regression Statistics	
Multiple R	0.80
R Square	0.64
Adjusted R Square	0.62
Standard Error	0.03
Observations	24.00

ANOVA					
	df	SS	MS	F	Significance F
Regression	1.00	0.03	0.03	38.55	0.00
Residual	22.00	0.02	0.00		
Total	23.00	0.04			

	Coefficients	Standard Error	t Stat	P-value	Lower 95.0%	Upper 95.0%
Intercept	0.11	0.01	14.91	0.00	0.10	0.13
Flanders = 1	(0.07)	0.01	(6.21)	0.00	(0.04)	(0.09)

NOTE: Hermes was used as intercept

Equation B-8 - Fiber Yield as a function of Seeding Method X Rate X Variety

Regression Statistics	
Multiple R	0.71
Multiple R Square	0.84
R Square	0.70
Adjusted R Square	0.68
Standard Error	85.44
Observations	48.00

ANOVA					
	df	SS	MS	F	Significance F
Regression	4.00	746,928.43	186,732.11	25.58	0.00
Residual	43.00	313,888.89	7,299.74		
Total	47.00	1,060,817.32			

	Coefficients	Standard Error	t Stat	P-value	Lower 95.0%	Upper 95.0%
Intercept	19.77	27.58	0.72	0.48	(35.84)	75.38
Row = 1	243.17	24.66	9.86	0.00	193.43	292.91
80kg/ha = 1	15.99	30.21	0.53	0.60	(44.93)	76.91
40kg/ha = 1	6.05	30.21	0.20	0.84	(54.87)	66.97
Flanders = 1	(54.23)	24.66	(2.20)	0.03	(103.97)	(4.49)

Note: Broadcast Hermes Seeded at 120kg/ha was used as intercept