CANADIAN AGRICULTURAL PARTNERSHIP
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SaskFlax

Canada

Research Results

# Determining the genetic control of flax fibre traits

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| **TERM** | 2 years, ending March 31, 2023 |
| **RESEARCHER** | Jodi Souter, J4 Agri-Science |
| **SASKFLAX INVESTMENT** | $55,748 |
| **TOTAL PROJECT COST** | $126,496 |
| **CO-FUNDERS** | Agriculture & Agri-Food Canada, J4 Agri-Science |

## Project Findings

### Grower Benefits

- Researchers have found that selection without multiple backcrosses to short statured lines was effective at developing short stature lines.
- From the analysis of harvestability, percent fibre is believed to be a quantitative trait. Successive selection should work to develop a lower percent fibre commercial line. This will help breeders in future breeding programs.
- The results of this project will help future short straw breeding efforts for flax growers as researchers and industry understand straw management is a barrier to flax production.

### Project Description

One of the most challenging aspects of growing flax is managing straw during and after harvest. Reducing the plant height and reducing the percent fibre in the straw would decrease the amount of fibre left to manage after the growing season. This project had two objectives, to

understand the genetic control of and reduce both height and fibre percentage. Additionally, another goal was to have populations created from both objectives for future flax breeding.

In objective one, flax lines that were documented to have short straw were accessed from the Plant Gene Resources of Canada. Crosses between the lines and CDC Bethune as well as other commercial varieties were completed. No incompatibilities were observed, so F2 populations from crosses with CDC Bethune were targeted for analysis. Seed from F2s and F3 populations that were previously developed by J4 Agri-Science were grown in 2021. In order to understand genetic control of height, the populations needed were developed in the first year of this project. Lines that showed some promise were noted and studied further in year two. Upon further investigation, some of the lines that had shown promise actually had long stems but the architecture of the plant was flat, so the amount of fibrous biomass would be similar to the tall plants. Although no 'dwarf gene' was identified, lines developed in previous crosses that were analyzed in this project and selected for height revealed that selection was effective at reducing heights in inbred lines. In the advanced generation lines, it was preliminarily found that when correlating height with yield, yield was lower in shorter lines than taller lines although this trend was not significant in commercial lines. Backcrossing short lines to adapted material to increase yield potential may be necessary in the future. Additional crosses have shown improvements in yield in the shorter material and will continue to be analyzed.

In objective two, twenty lines previously documented to contain a low percent fibre in the stem were accessed from the Plant Gene Resources of Canada. Ten of the lines that had reported fibre percentage under 14% were the main targets for this part of the project, but crosses were also made between commercial lines and the 10 lines with fibre between 14-20%. F1 lines were selfed and advanced to F2 generation in greenhouses. In year two, it was noted that some of the accessions in the trial were very tall, even if they did have half the fibre percentage per unit stem length. Some were shorter than the CDC Bethune however, which would prove to be more ideal in combination with the low percent fibre. There was a difference between some of the parent lines and CDC Bethune for harvestability with the parent lines being easier to thresh without leaving as much fibrous residue. In fact, one cross between CDC Bethune and 'Saguino' parent lines did show some preliminary segregation for the ease of harvestability phenotype, but individuals from the F2 population will have to be taken forward to homozygosity in order to have enough stem material to accurately assess harvestability in the future. Researchers were able to decide which populations to advance to be able to have enough sample to determine if the low fibre can be efficiently selected for in the future.