



Evaluation of fusarium wilt resistance in a flax germplasm



**Soils and Crops -
March 17th 2015**

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Flax

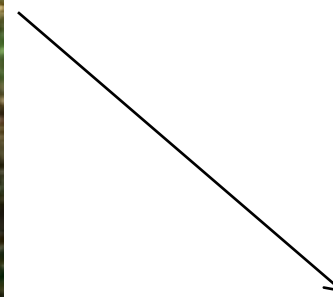
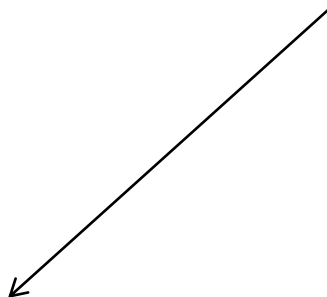


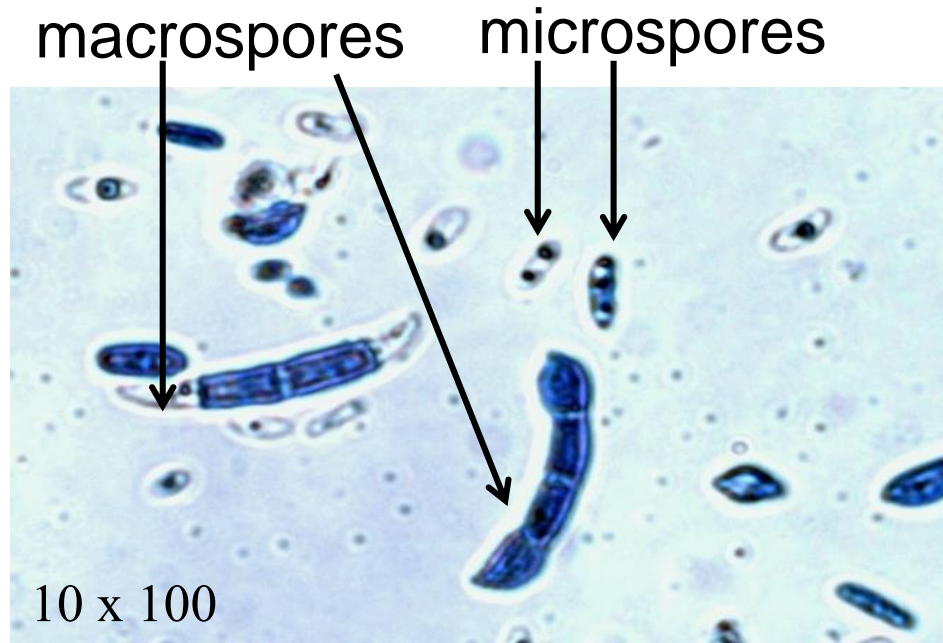
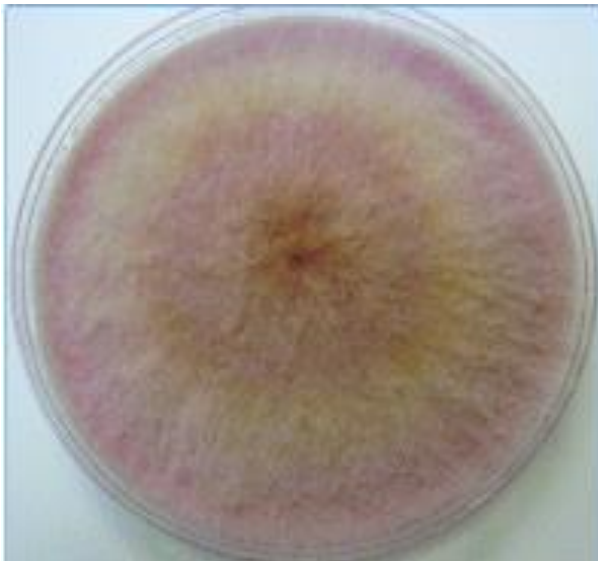
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Photo credit: wikipedia

Fusarium Wilt of Flax

- ✓ Caused by *Fusarium oxysporum* f. sp. *lini* – *Fol*
- ✓ Soil-borne
- ✓ Enters through the root system
- ✓ Colonizes within xylem



Symptoms

- ✓ "Yellowing, grey root"
Root rot
- ✓ Wilting



Importance of Fusarium Wilt Resistant Flax

- ✓ *Fol* pathogen able to survive for long periods in the absence of host
- ✓ No efficient way to eradicate *Fol* pathogen from soil

Research Objectives

- 1) to assess wilt disease development in selected varieties with isolates collected from SK and MB
- 2) to screen a RIL population for fusarium wilt under controlled environment and compare the observations with a field trial

Procedure and Results

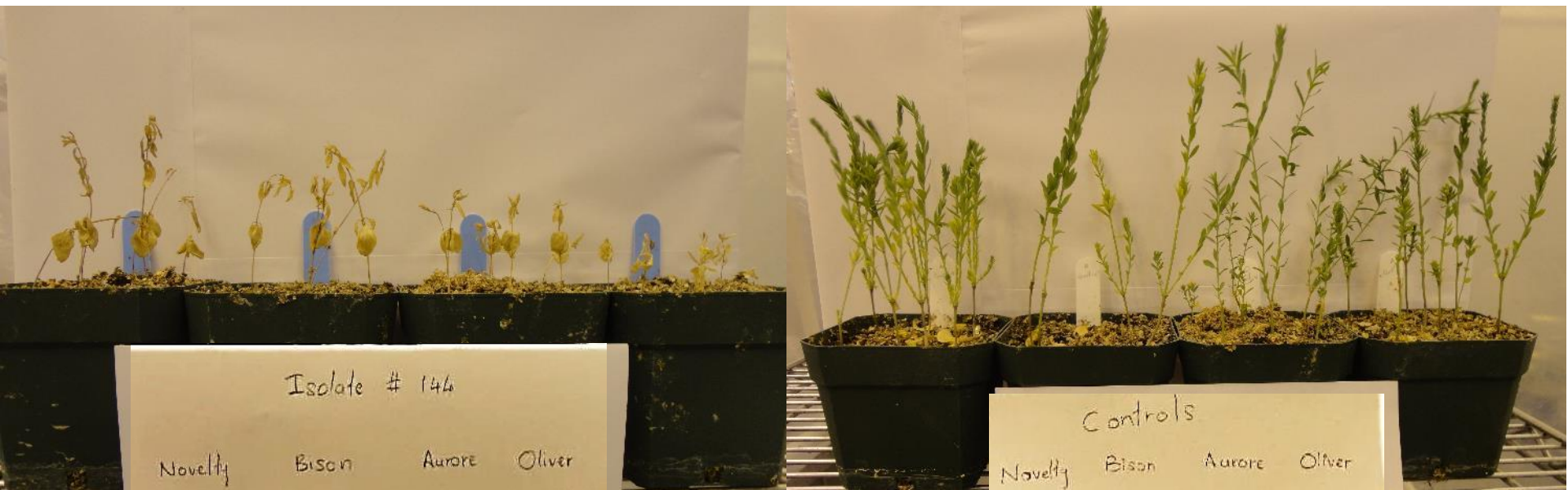
Disease Screening



- ✓ 17701 isolates
- Resistant – Bison
- Susceptible – Novelty
- ✓ In Czapek-Dox medium
- Parents of RIL:
- ✓ Concentration adjusted to 10^6 spores/ml
- Moderately resistant – Aurore
- Susceptible – Oliver
- ✓ Erlenmeyer flasks inoculated with 15 ml of spore suspension



Disease development in 4 varieties with 3 isolates



ANOVA in of AUDPC and DS

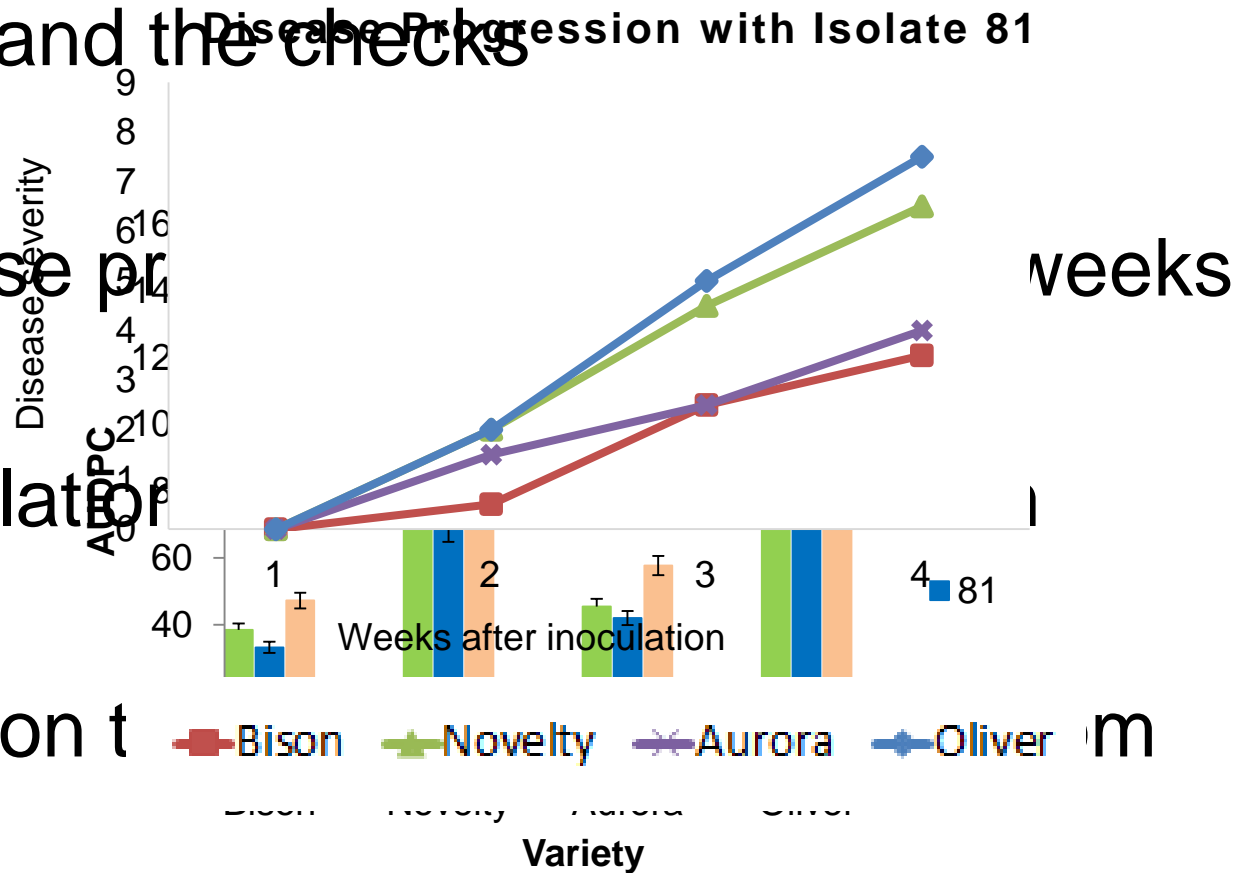
	AUDPC	Disease Severity
Isolate	28.27***	14.72***
Variety	97.97***	20.96***
Isolate*Variety	2.93***	0.82

Aggressiveness of Isolates

High	Moderate	Weak
132	65	66
135	81	130
144	131	134
146	133	138
	137	139
	142	159
	143	

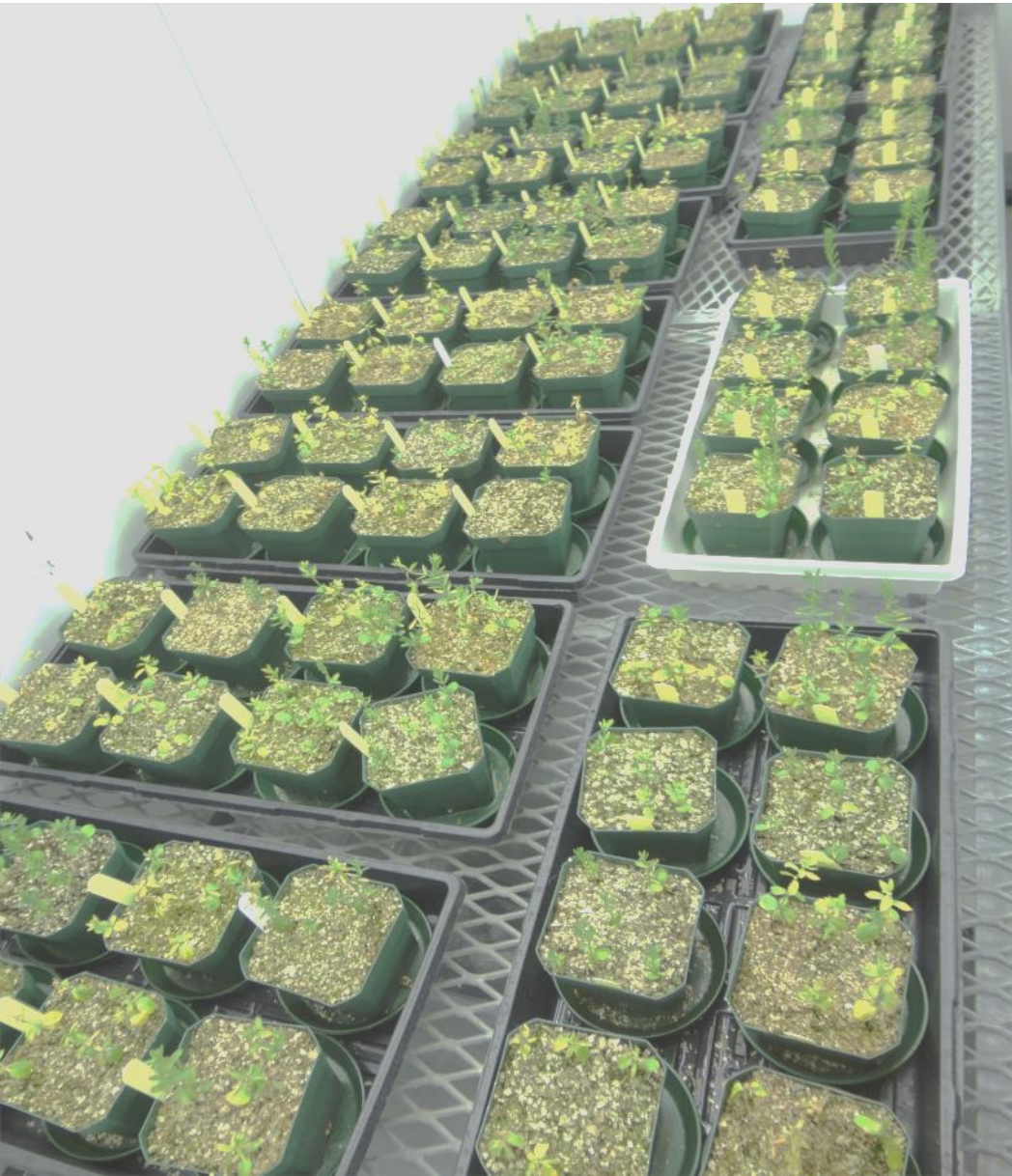
3 isolates selected,

- Disease progression over the four weeks
- Differential interaction between Aurore and Oliver and the checks



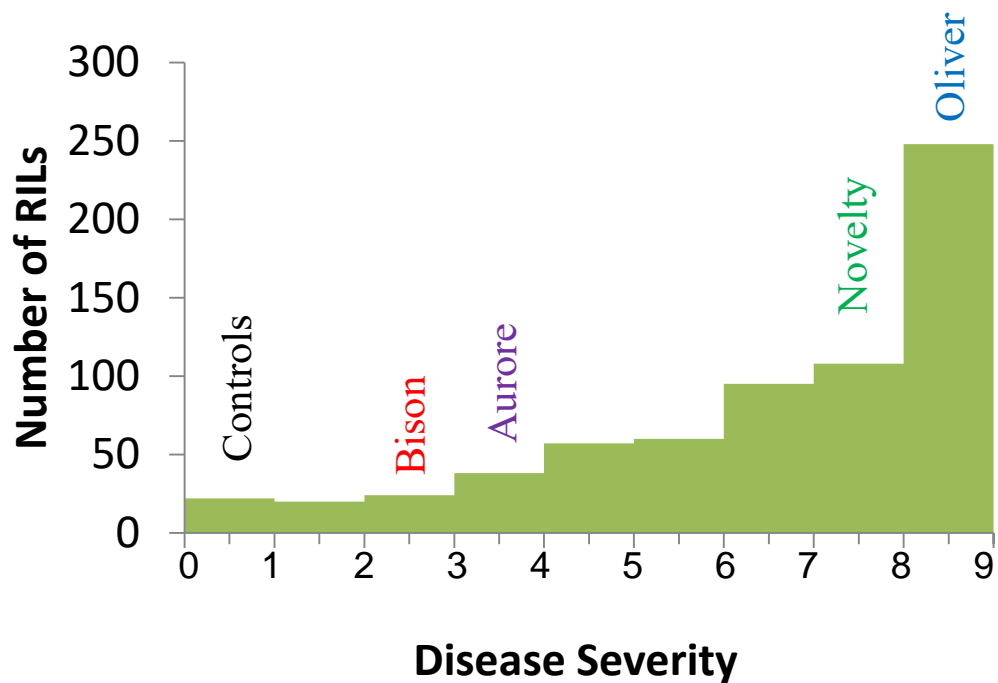
- Disease progression
- Sporulation
- Location

RIL Phenotyping- Growth Chamber

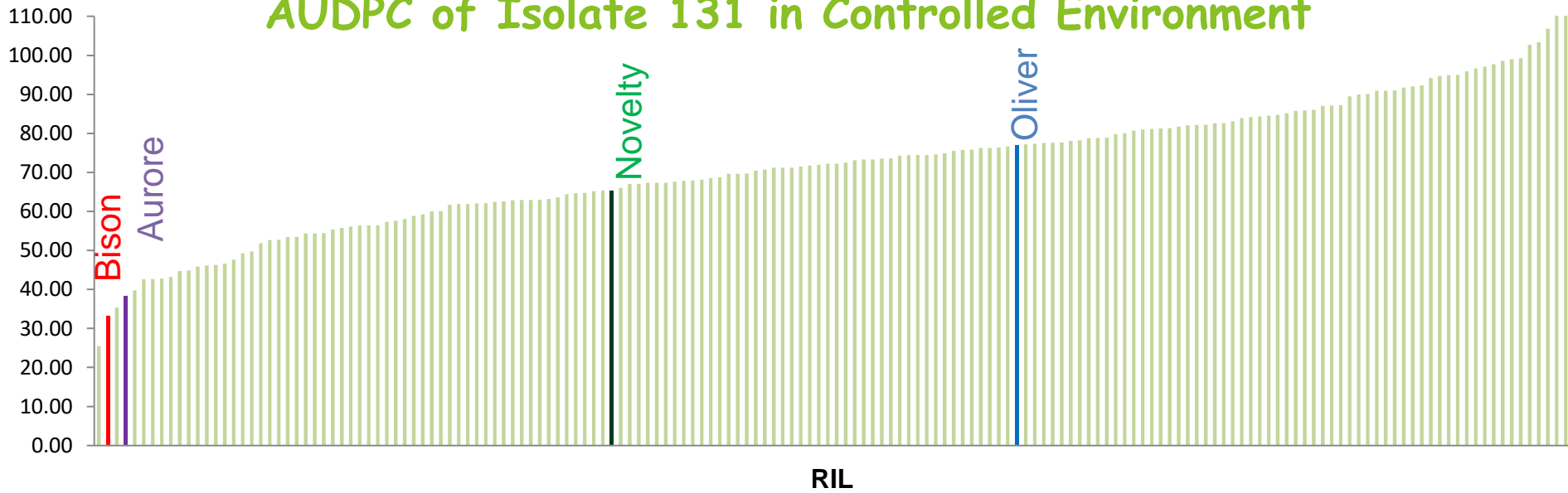


- ✓ **160 RILs**
- ✓ **RCBD**
- ✓ **2 reps, 1 repeat**
- ✓ **Disease severity**
- ✓ **Plant height**

Frequency Distribution of DS at 28 DPI with Isolate 131



AUDPC of Isolate 131 in Controlled Environment



Pearson's Correlation Coefficients of DS, Height and AUDPC

Isolate		DS	Height	AUDPC
65	DS	1.000		
	Height	- 0.468***	1.000	
	AUDPC	0.757***	- 0.471***	1.000
81	DS	1.000		
	Height	- 0.227***	1.000	
	AUDPC	0.803***	- 0.298***	1.000
131	DS	1.000		
	Height	0.018	1.000	
	AUDPC	0.837***	- 0.132***	1.000

RIL Phenotyping in Wilt Nurseries

- ✓ **200 RILs**
- ✓ **MAD**
- ✓ **At two locations**
- ✓ **3 growth stages**
- ✓ **Assessed**
 - ✓ **Plant stand**
 - ✓ **Disease severity**
 - ✓ **Vigour**



ANOVA in Multiple Years and Locations

Trait	Source	F
AUDPC	Year	652.25***
	Location	184.03*
	Year*Location	2.05
	Genotype	12.63***
	Year*Genotype	4.64309***
	Location*Genotype	0.83
	Year*Location*Genotype	5.52***

Correlation Analysis for 160 RILs

Pearson's correlation coefficients for AUDPC

	Saskatoon 2013	Morden 2013	Saskatoon 2014	Morden 2014	Isolate 65	Isolate 81	Isolate 131
Saskatoon 2013	1						
Morden 2013	0.622***	1					
Saskatoon 2014	0.562***	0.493***	1				
Morden 2014	0.385***	0.297***	0.273***	1			
Isolate 65	0.386***	0.268***	0.512***	0.037	1		
Isolate 81	0.3633***	0.186**	0.343***	-0.057	0.481***	1	
Isolate 131	0.377***	0.307***	0.350***	0.105	0.283***	0.365***	1

Conclusions

- ✓ Controlled environment phenotyping can be used as predictors for the amount and DS of wilt in the field
- ✓ The environment, Fol pathogen structure and the resistance of a variety/ breeding line determines the amount of disease developed
- ✓ Wilt disease negatively affects the plant growth reducing plant height, which might affect plant yield

Acknowledgements

Supervisors

- Dr. Helen Booker
- Dr. Randy Kutcher



Collaborators

- Dr. Khalid Rashid
- Dr. Sylvie Cloutier
- Dr. Frank You



**Saskatchewan
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Agriculture**

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- Dr. Kirstin Bett
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- Dr. Sabine Banniza, Dr. Lester Young
- Members of the Flax Breeding Program & Cereal and Flax Pathology Program

The background of the slide features a close-up photograph of several light blue flowers with prominent yellow stamens and green foliage. The flowers are in various stages of bloom, with some fully open and others as buds. The lighting is soft, creating a natural and serene atmosphere.

Questions?

