Web Based Harvest and Disease Control Models for Saskatoon Fruit Production

Year 1: Results

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Greenspace MANAGEMENT

RED RIVER COLLEGE
OF APPLIED ARTS, SCIENCE AND TECHNOLOGY

Outline

- Introduction
- Setting the Stage
- Field Measurements
- Results: Model Assessment
- Interesting Observations and Feedback
- Future Work

Introduction

Introduction

Amelanchier alnifolia

- Native to the Canadian Prairies
  - Grown as a fruit crop in the 3 Prairie Provinces
  - Even on the island
  - Increasing US interest
  - Gaining popularity in a wide variety of products


saskatoons
pack a nutritional punch
Saskatoon Berry
Chocolates
Silverbend
Plantation
Buffalo Pemmican
Pemmican de bison
45 g

Wheat Free Peanut Butter and Saskatoon Dog Biscuits - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites History

Address http://www.lucky-dog-biscuits.com/Product.asp?Product=WF-Peanu... Go Links

LUCKY DOG BISCUITS

made with the good stuff

PEANUT BUTTER & SASKATOON BERRY

WHEAT FREE!

SKU	Size	Price	Qty
WF-PeanutSask300		$7.99	1

BUY NOW!

Saskatoon berries are big and juicy, filled with vitamins and antioxidents, making these dog biscuits the favourite of the bunch. Okay, the peanut butter might have something to do with it too.

The Good Stuff:

Oatmeal, natural peanut butter, Saskatoon Berries, eggs, apple sauce, milk, ground flax, honey, cinnamon, vitamin e

Nutritional Information	
Protein	18.8%
Fibre	9.4%
Fat	21.5%
Moisture	5.4%
Protéines	18.8%
Fibré	9.4%

LUCKY DOG BISCUITS | made with the good stuff

Internet

start Presentations Microsoft Excel - Fi... Microsoft PowerPoi... Wheat Free Peanu... 3:11 PM

Introduction

Amelanchier alnifolia

- Noteworthy News....
  - New Guide for Commercial Production

Introduction

Amelanchier alnifolia

- 2006 was a good year
  - Weather
  - Growth
  - Optimism

- **Implement 5 years of PhD research**

Introduction

Objective:

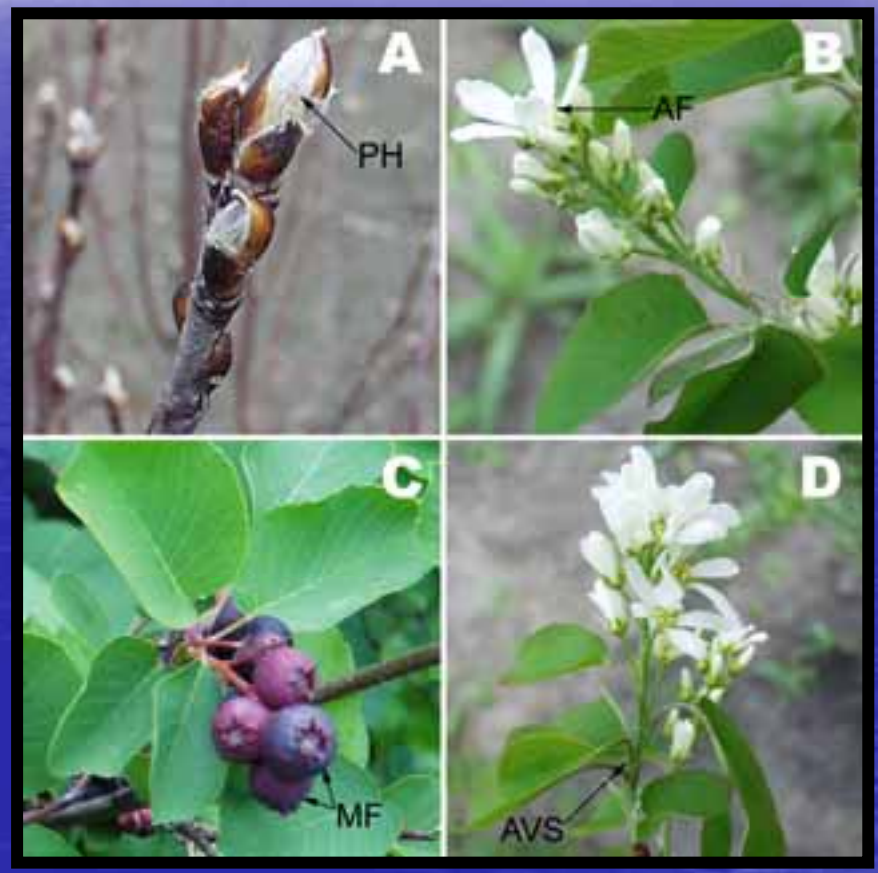
- Minimize yield lost due to:

1) Optimize Harvest Efforts

2) Entomosporium Leaf and Berry Spot

Introduction

- **Why develop a phenological forecasting model for saskatoons?**
  - Predict peak harvest date for mechanical harvesting
  - Regulate chemical applications to control pests



Introduction

3 Types of Phenological Models:

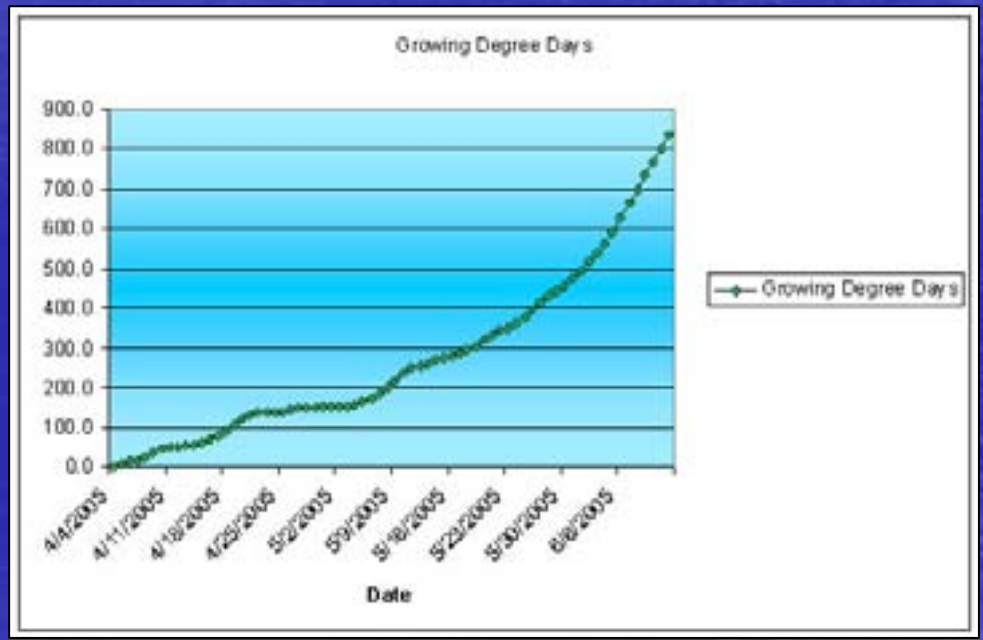
1. **Calendar day**

Introduction

3 Types of Phenological Models:

2. Growing Degree Day (GDD)

- Base temperature
- Assumes linear growth above the base temperature

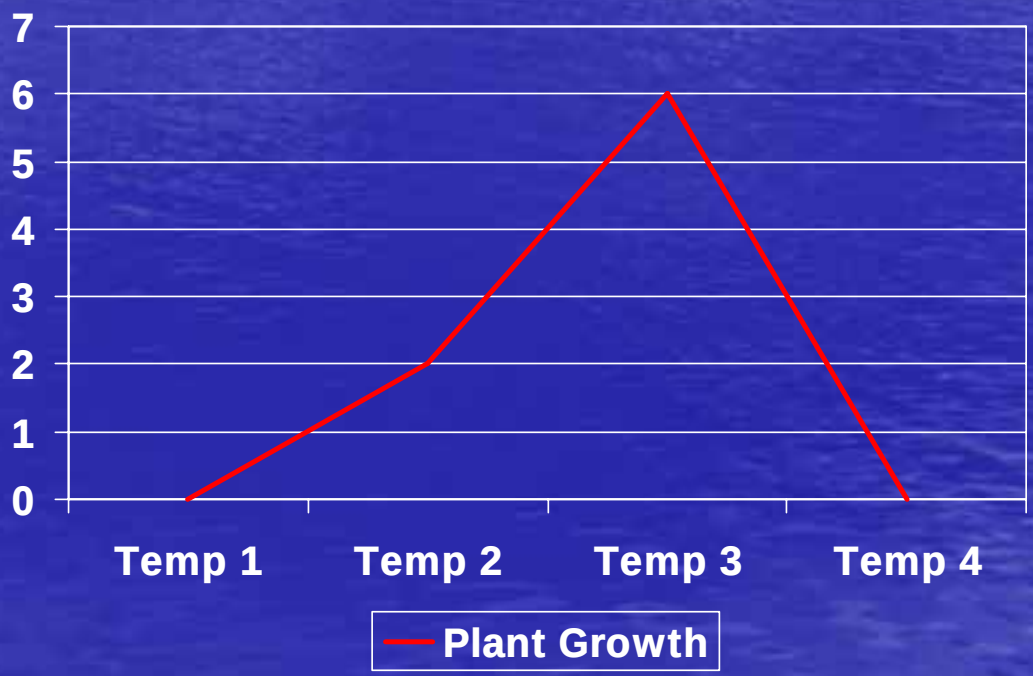


Introduction

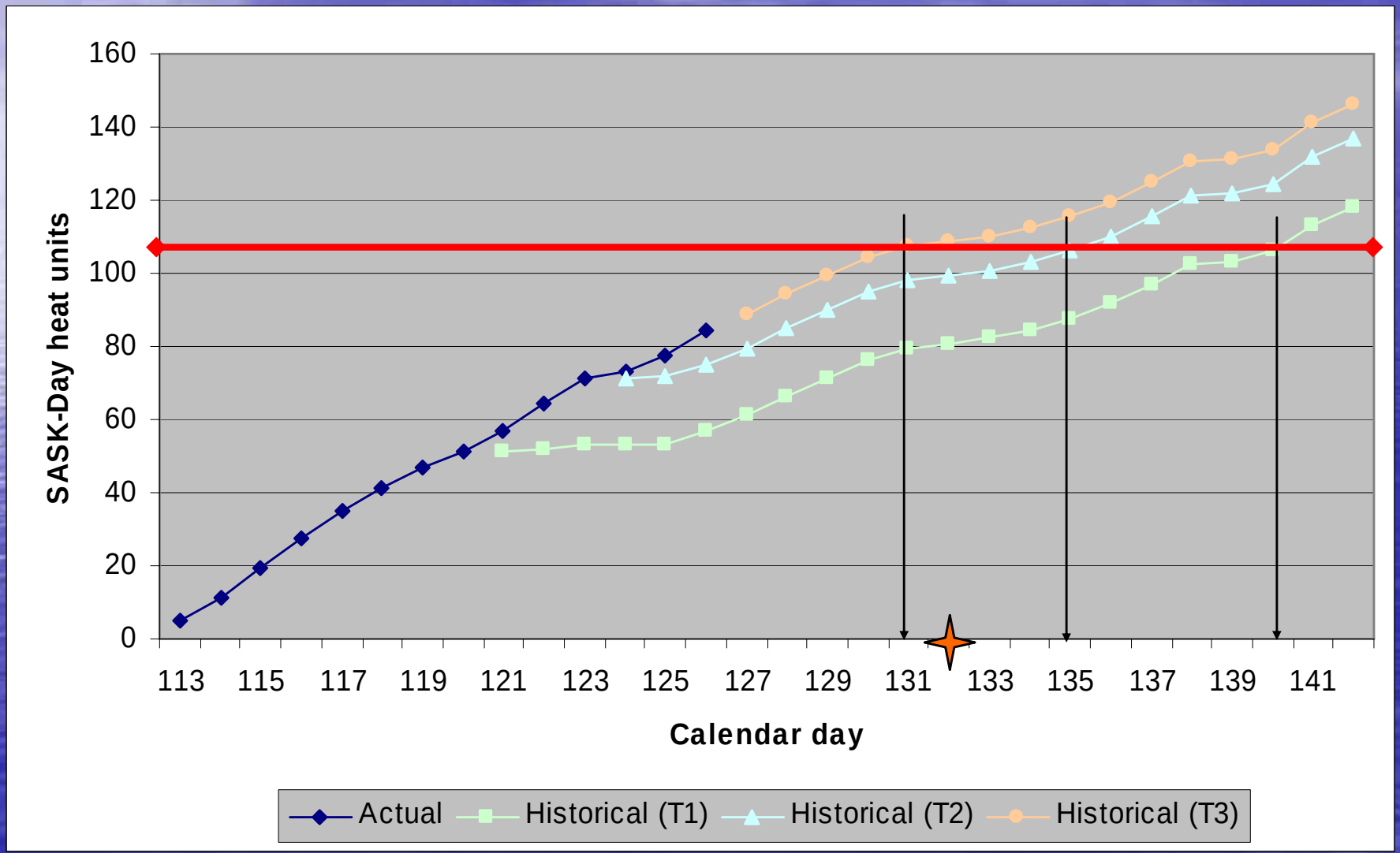
3 Types of Phenological Models:

3. Potato day (P-Day)

- Minimum, optimum, and maximum temperatures



Introduction



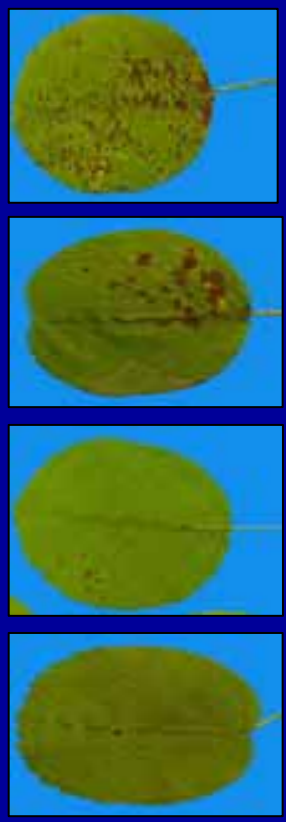
Introduction

- Why develop a disease forecasting model for saskatoons?
  - Increase marketable yield ~ improving quality
  - Stabilize yearly production
  - Potential to optimize fungicide use:
    - Decrease environmental damage
    - Increase consumer confidence
    - Reduce input costs
    - Slow development of resistance

Introduction

Entomosporium leaf and berry spot

- Highly weather dependent
  - Warm, precipitation, and extended leaf wetness
    - Davidson et al. (1991)
- Host resistance
  - Cultivar susceptibility



Over wintering inoculum

Conidia germinate

Infection occurs within 48 h

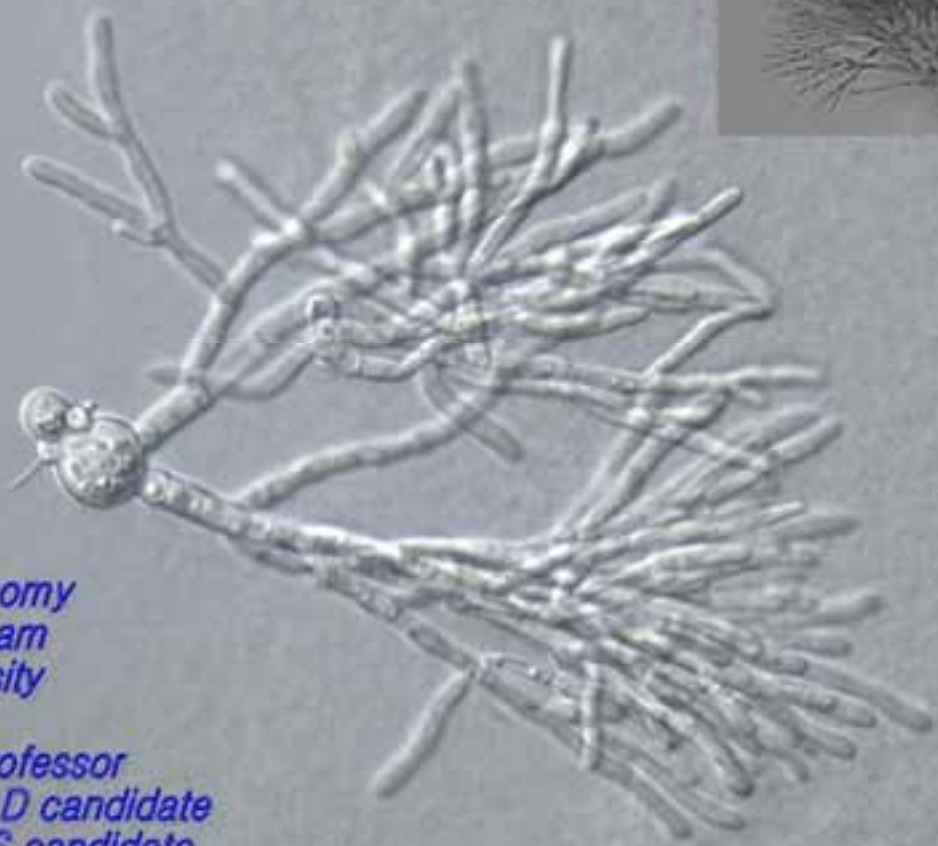
Acervuli form on leaves within 4-7 d

Repeating Cycles of Infection 7-14 d (Polycyclic)

ASEXUAL Life Cycle

Merry Chrystmas & A Happy New Year!

Entomosporium mespili



Fungal Taxonomy
& Ecology Team
Korea University

H.D. Shin, Professor
Y.J. Choi, Ph D candidate
M.J. Park, MS candidate
J.G. Han, MS candidate

Fan-like Growth of Conidium after Germination

Introduction

Entomosporium leaf and berry spot

- IPM
- Chemical
  - Fungicides
    - Kumulus (Sulfur)
    - Funginex (Triforine)
    - Topas 250E (Propiconazole)
- Recommended 3 applications

Introduction

Weather monitoring

- Weather monitoring is important for both phenological and dynamic disease forecast models

Introduction

Weather monitoring

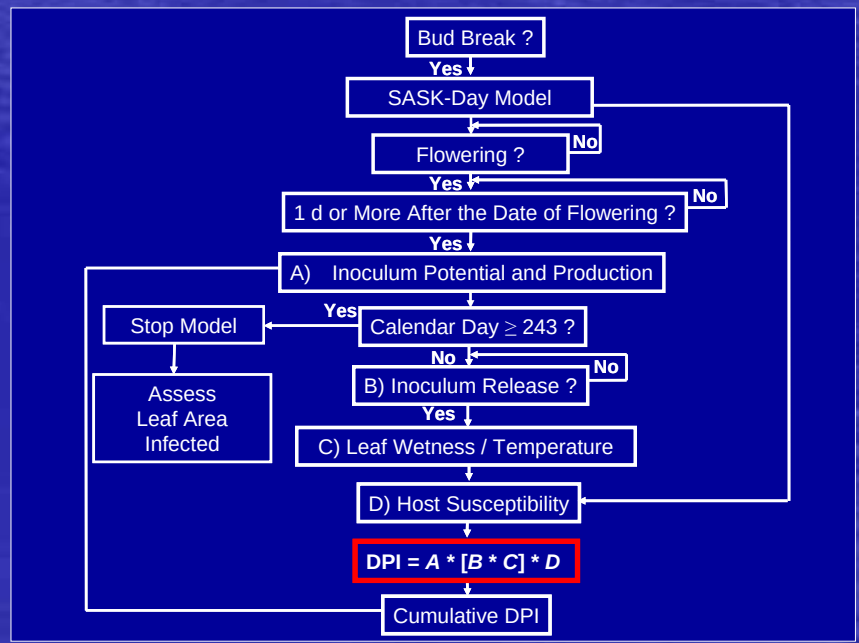
Important weather variables:

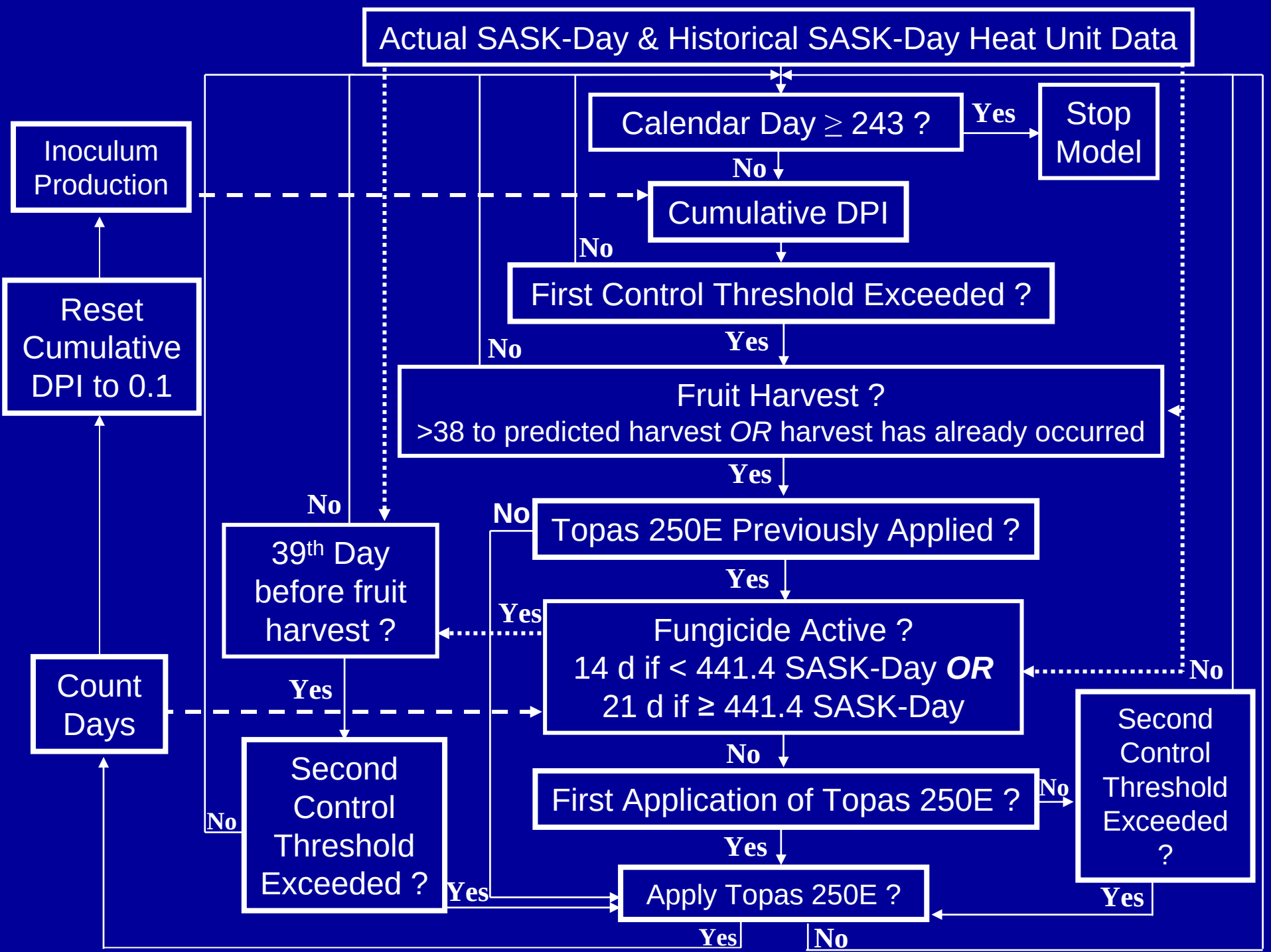
- **Temperature**
- **Precipitation**
- Leaf wetness
- RH
- Solar radiation
- Wind speed and direction

Introduction

A Dynamic Disease Forecasting Model

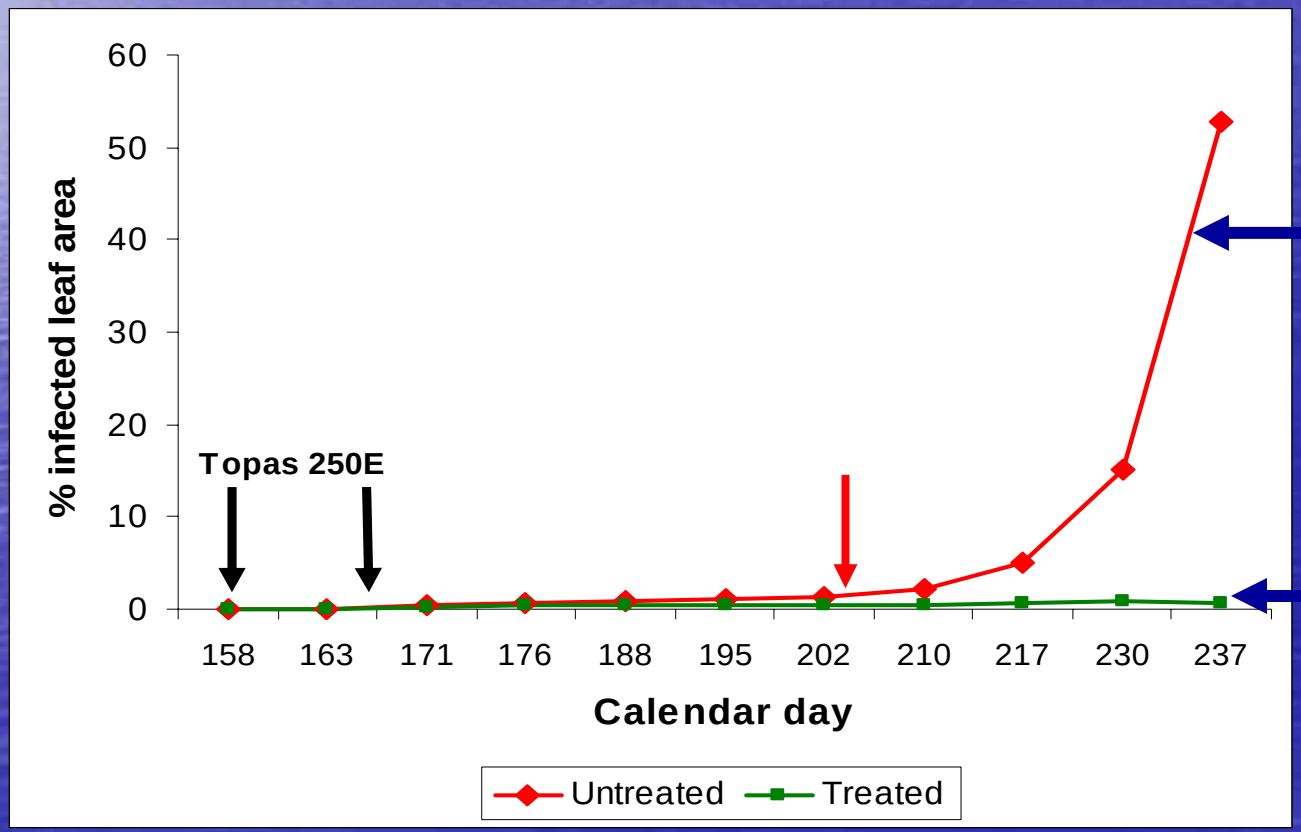
- Temperature and leaf wetness
- Leaf age vs. leaf susceptibility
- In field inoculum assessment
- Inoculum release




Actual SASK-Day & Historical SASK-Day Heat Unit Data
Calendar Day ≥ 243 ?
Yes
Stop Model
No
Inoculum Production
Cumulative DPI
No
First Control Threshold Exceeded ?
Reset Cumulative DPI to 0.1
No
Yes
Fruit Harvest ?
>38 to predicted harvest OR harvest has already occurred
Yes
No
No
Topas 250E Previously Applied ?
39th Day before fruit harvest ?
Yes
Yes
Fungicide Active ?
14 d if < 441.4 SASK-Day OR
21 d if ≥ 441.4 SASK-Day
No
Count Days
Yes
Second Control Threshold Exceeded ?
No
No
First Application of Topas 250E ?
No
Second Control Threshold Exceeded ?
Yes
Yes
Apply Topas 250E ?
Yes
Yes
No

Introduction

- Preliminary Test:
  - Smoky



Introduction

- **Simplify the model to make it effective yet relatively easy to use**
- **Design a web site to help growers implement the results from this research**
- **Assess suitability for different cultivars in different growing regions**
- **More years to validate the model**

Setting the Stage

Setting the Stage

In Search of Funding

- **PFGA, SFGA, FGSA**
- Turned down by Western Diversification Program
- **MRAC**
  - **Advancing Canadian Agriculture and Agri-Food**

Setting the Stage

Project Approval

- Approved April 2006
- Late start!
  - Hit road running
  - Supportive family

Setting the Stage

Study Participants

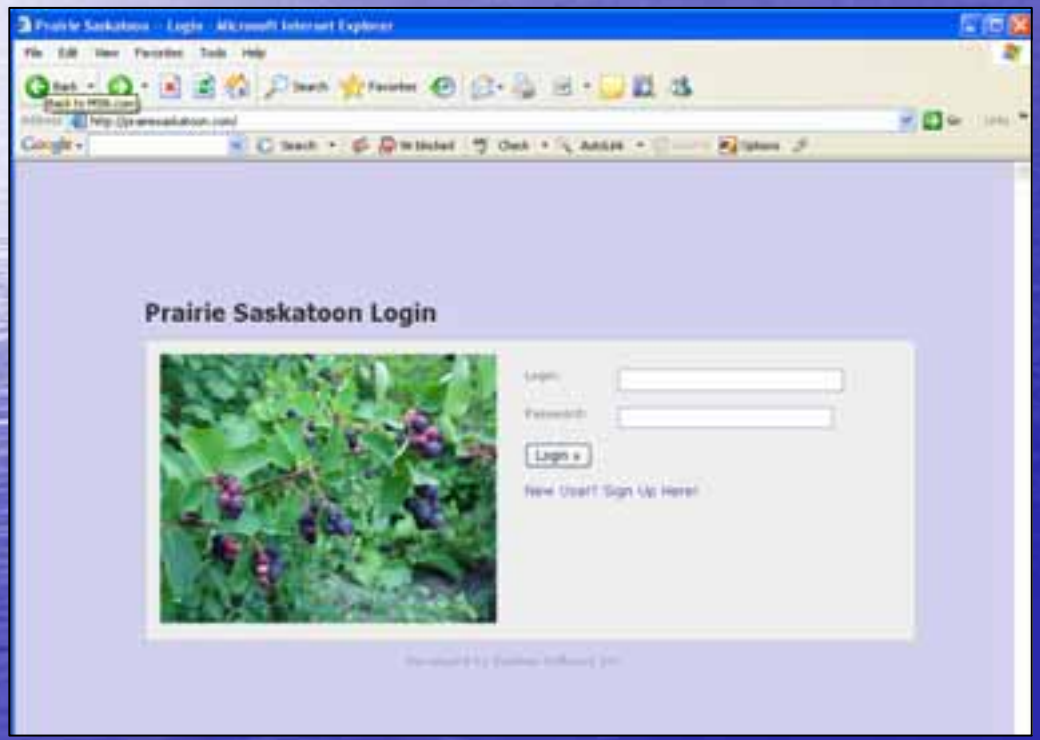
- Participation Difficultly
  - Roughly 40 sites registered
  - **Sign up today!!!!**

- **MB 7**
- **SK 10**
- **AB 10**

NEWS FLASH....

- **100 Growers Needed!**
- **What you will need to participate:**
  - **Willingness to follow protocol**
  - **Roughly 1 ac**
    - **Model vs. Control**
  - **Computer with internet**
  - **Topas 250E**
  - **Max/min thermometer**

Setting the Stage



A Web Based Model

- Redline Software Inc.
  - *Marc Jeanson*

Setting the Stage

Ready, Set.....

- User Guide
- Visit Producer Groups
- Max/Min thermometers
  - Problems...
- GPS Participants

Setting the Stage

Hit the Road Jack...

- July 4 Manitoba
- July 6 Saskatchewan
- July 11 Alberta
  - Finish: July 15

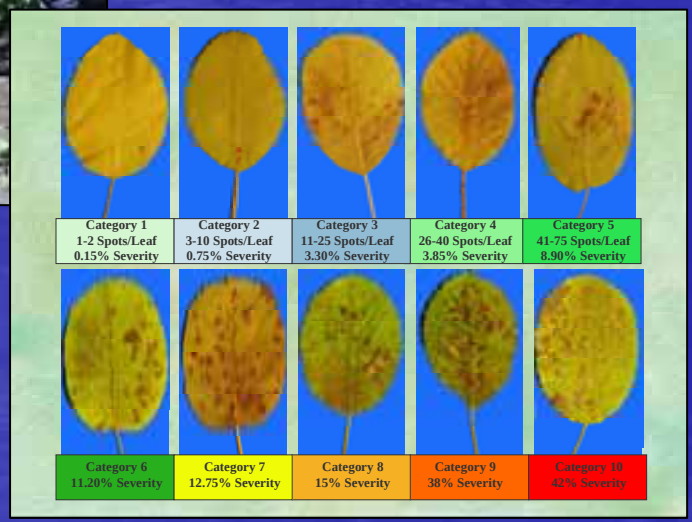
Field Measurements

Field Measurements

- Data entry by producer into the web software:
  - Organization information
  - Date of bud break, flowering and fruit harvest
  - Daily max/min temperatures
  - Rainfall yes/no
  - Topas 250E application?

Field Measurements

- Harvest time data collection:
  - Model vs. Control
    - Fruit
      - Total number
      - Number Infected
    - Leaf disease severity
    - Number of Topas 250E applications



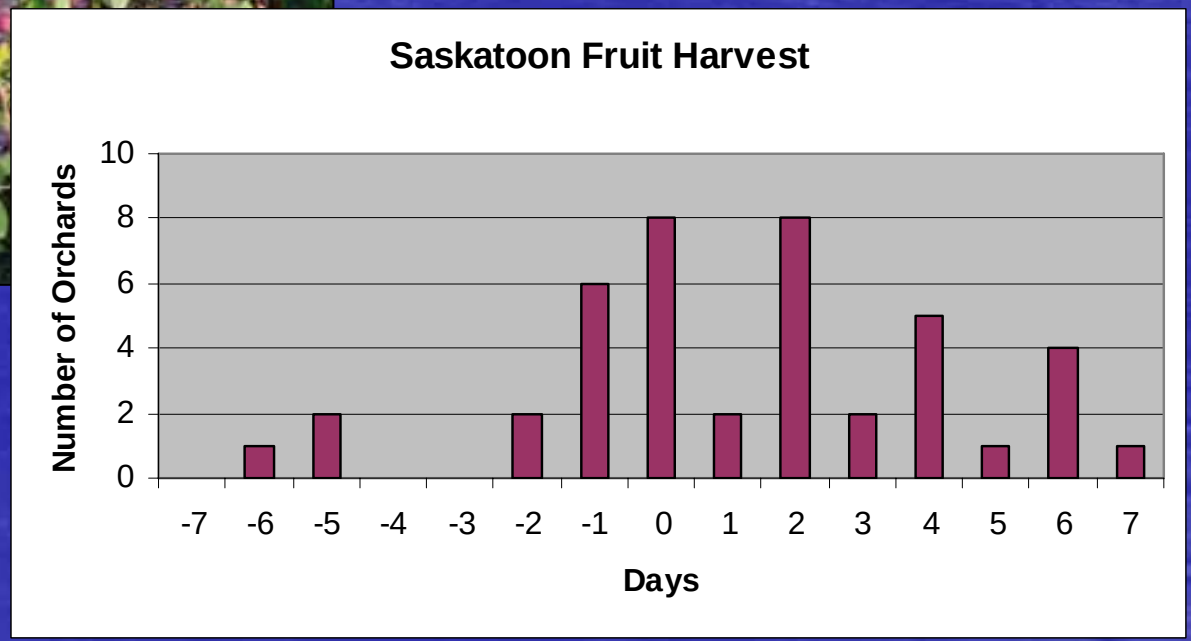
Field Measurements

- End of growing season:
  - Leaf disease severity for Control vs. Model

Results: Model Assessment

Results: Model Assessment

- Harvest Prediction:
  - 42 sites
  - Standard Deviation:
    - 1.92 days
    - Thesis (2.8 days)



Results: Model Assessment

- Fruit Yield:

Cultivar	Fruit/Raceme
Smoky	5.73
Northline	5.75
Thiessen	6.58
Honeywood	5.95
Martin	5.57

Results: Model Assessment

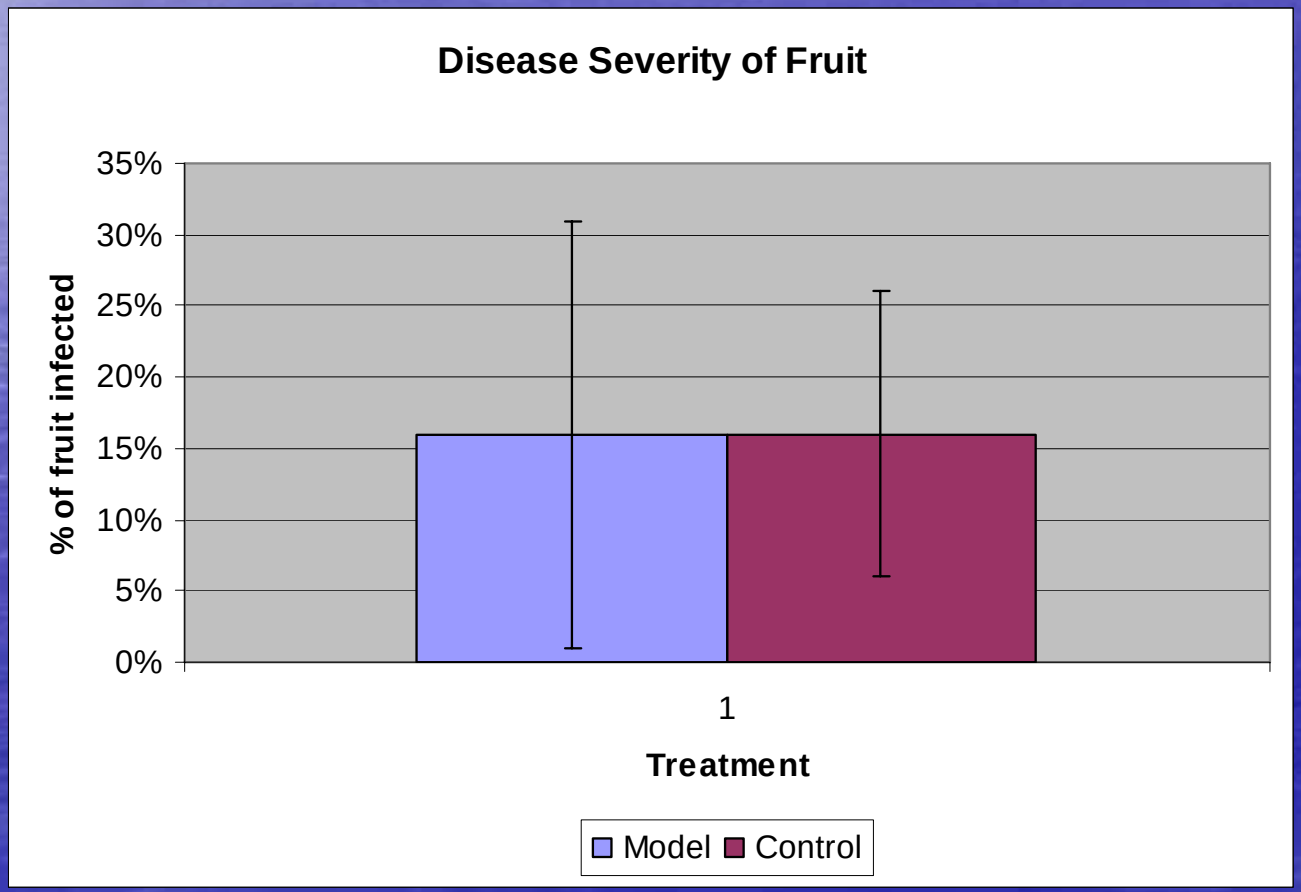
- Fruit Yield:

Manitoba					Saskatchewan					Alberta					
S	N	T	H	M	S	N	T	H	M	S	N	T	H	M	
5.6	**3.1**	**6.5**	**6.0**		**5.5**	**6.8**	**6.5**		**5.6**	**6.0**	**6.6**	**6.7**			**Mean**
8.2	5.2	6.5	6.0		6.9	**8.2**	8.0		7.2	7.3	7.4	**8.0**			**Max**
3.9	1.0	6.5	6.0		4.0	5.4	5.1		4.7	4.6	5.2	5.4			**Min**
4.3	4.2	0.0	0.0		2.9	2.9	2.9		2.5	2.7	2.2	2.7			**Range**

- **MB 5.19**
- **SK 6.08**
- **AB 6.30**

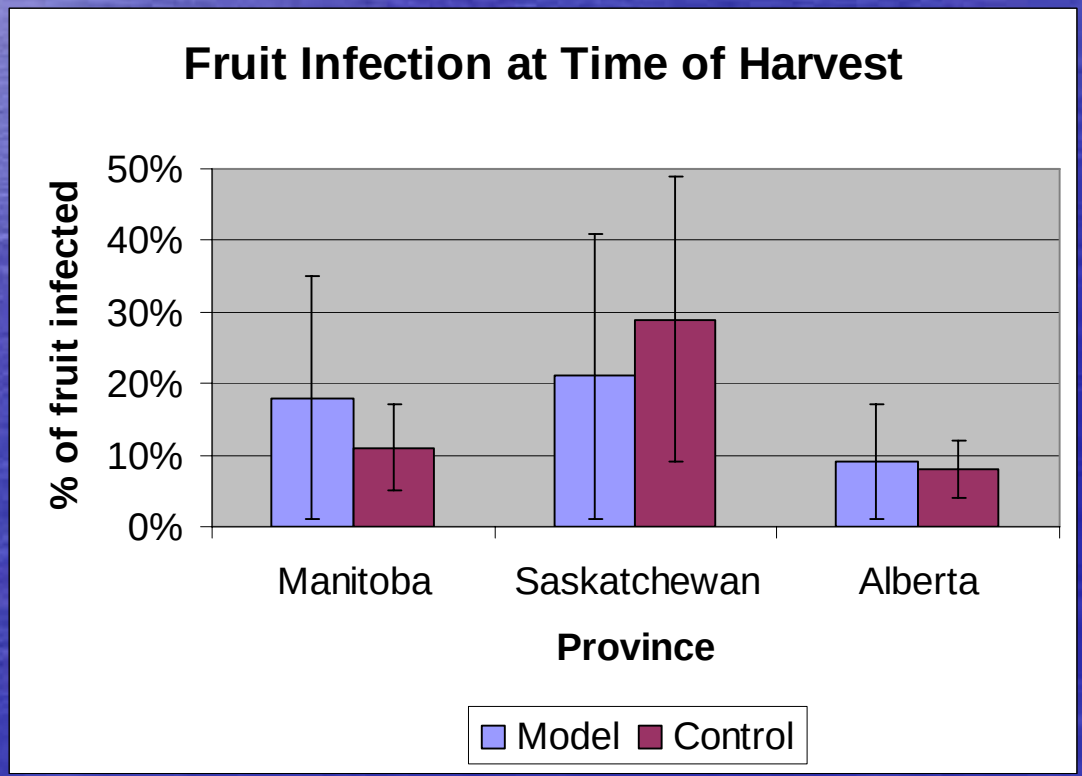
Results: Model Assessment

- Fruit Infection:



Results: Model Assessment

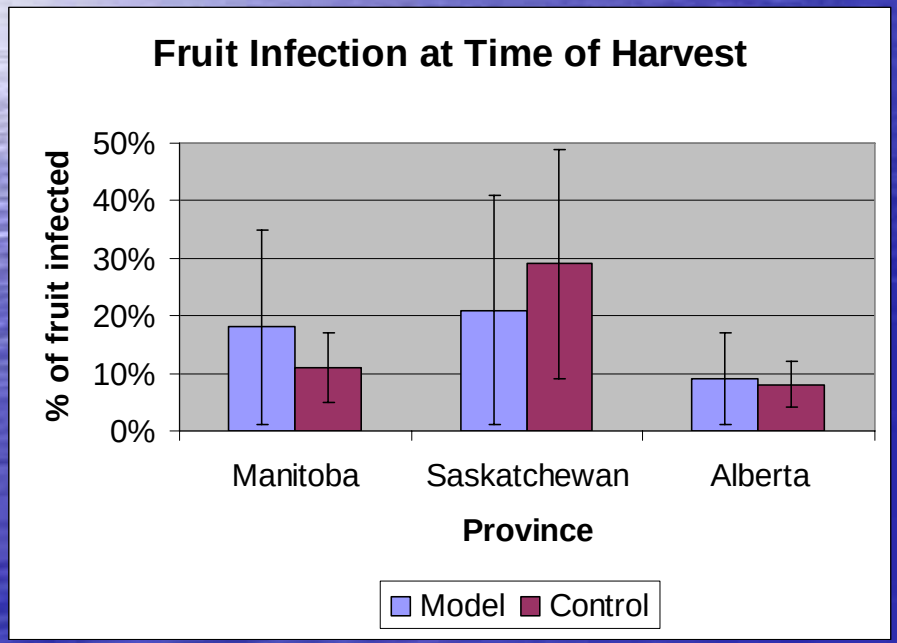
- Fruit Infection ~ Provincially:
  - 1 to 2 orchards in each Province had relatively poor disease control success

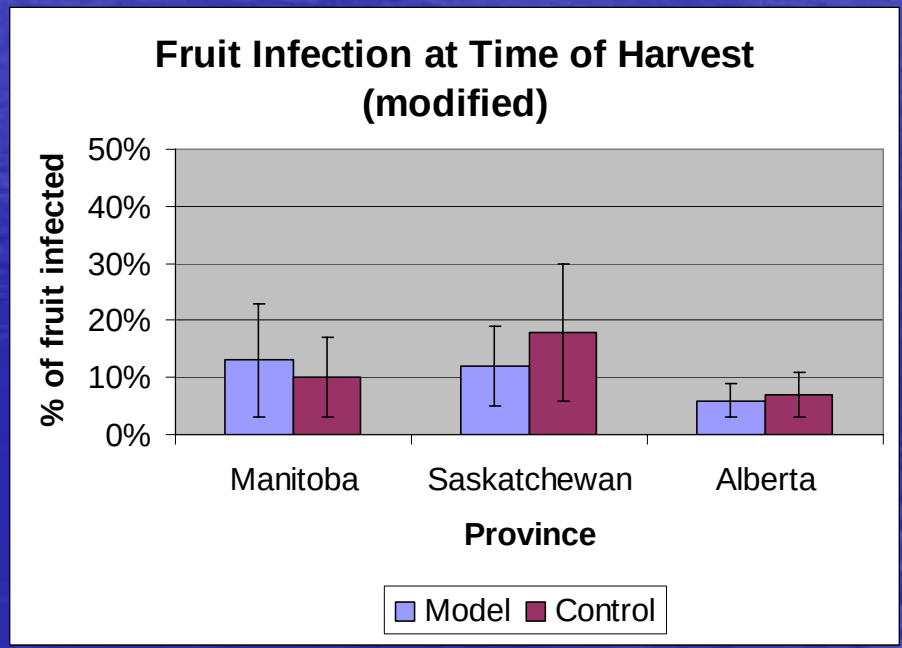


Results: Model Assessment

- Fruit Infection ~ Provincially:

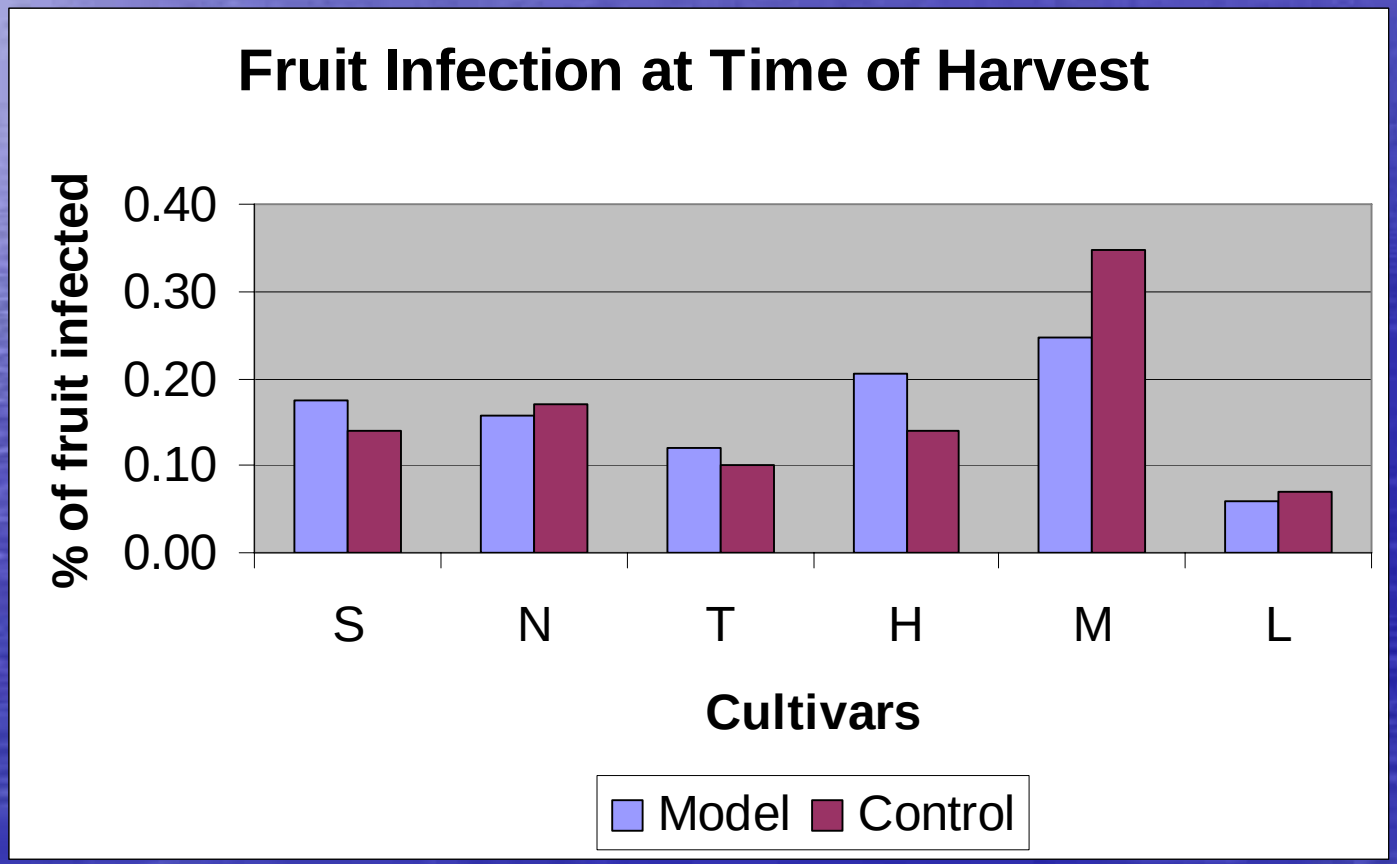
Removed:
1 Orchards MB
2 Orchards SK
2 Orchards AB





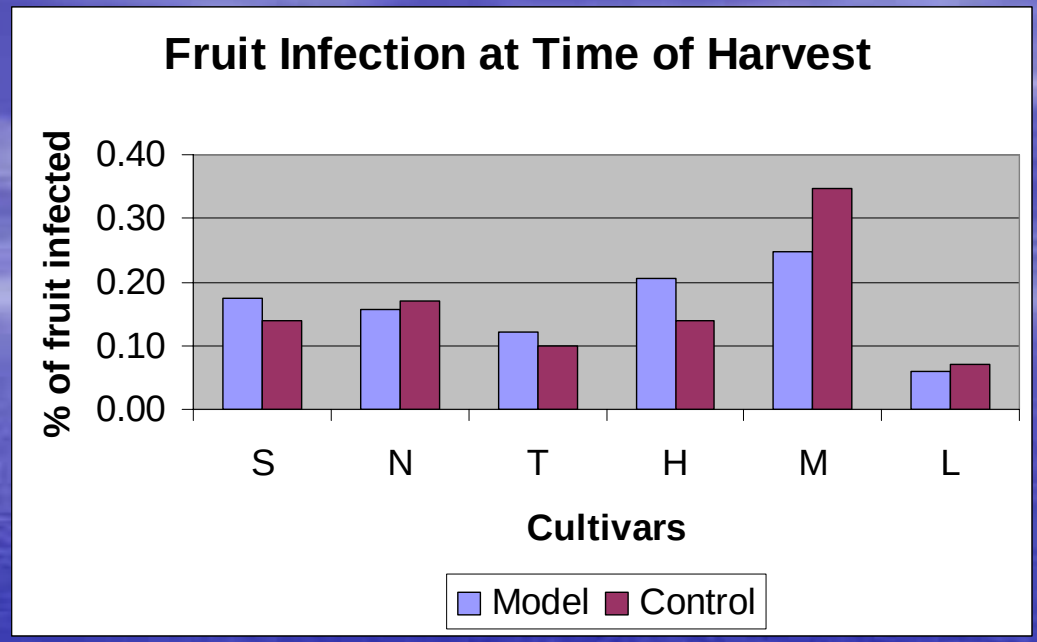
Results: Model Assessment

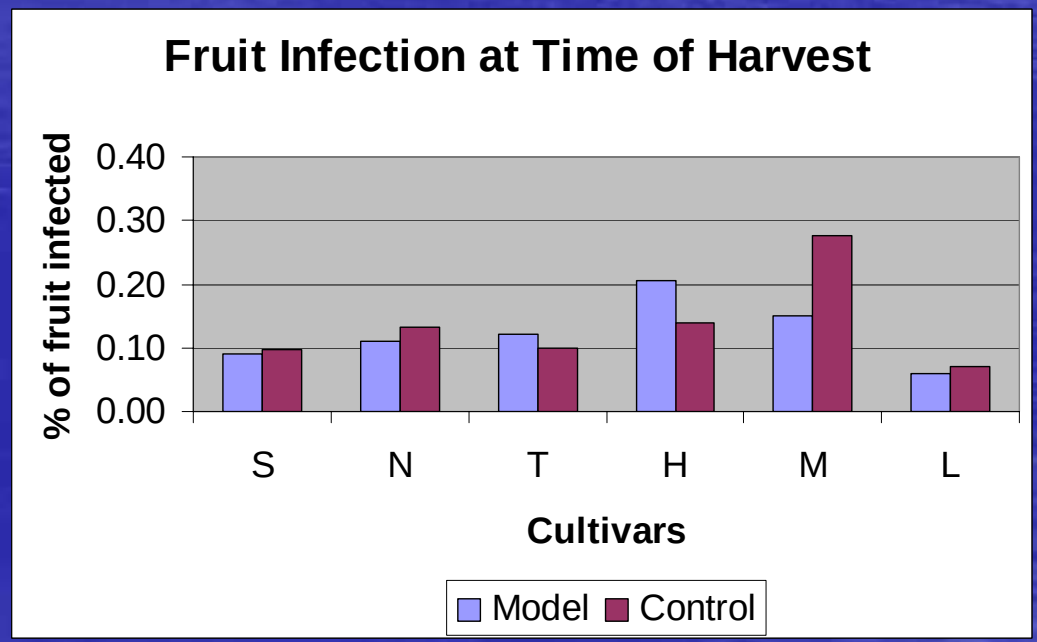
- Fruit Infection ~ Cultivars:



- Fruit Infection ~ Cultivars:

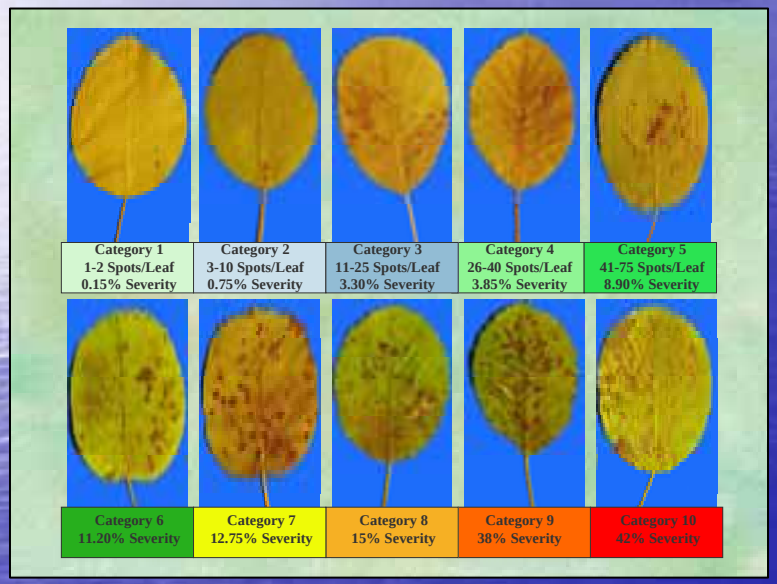
Removed:
1 Orchards MB
2 Orchards SK
2 Orchards AB

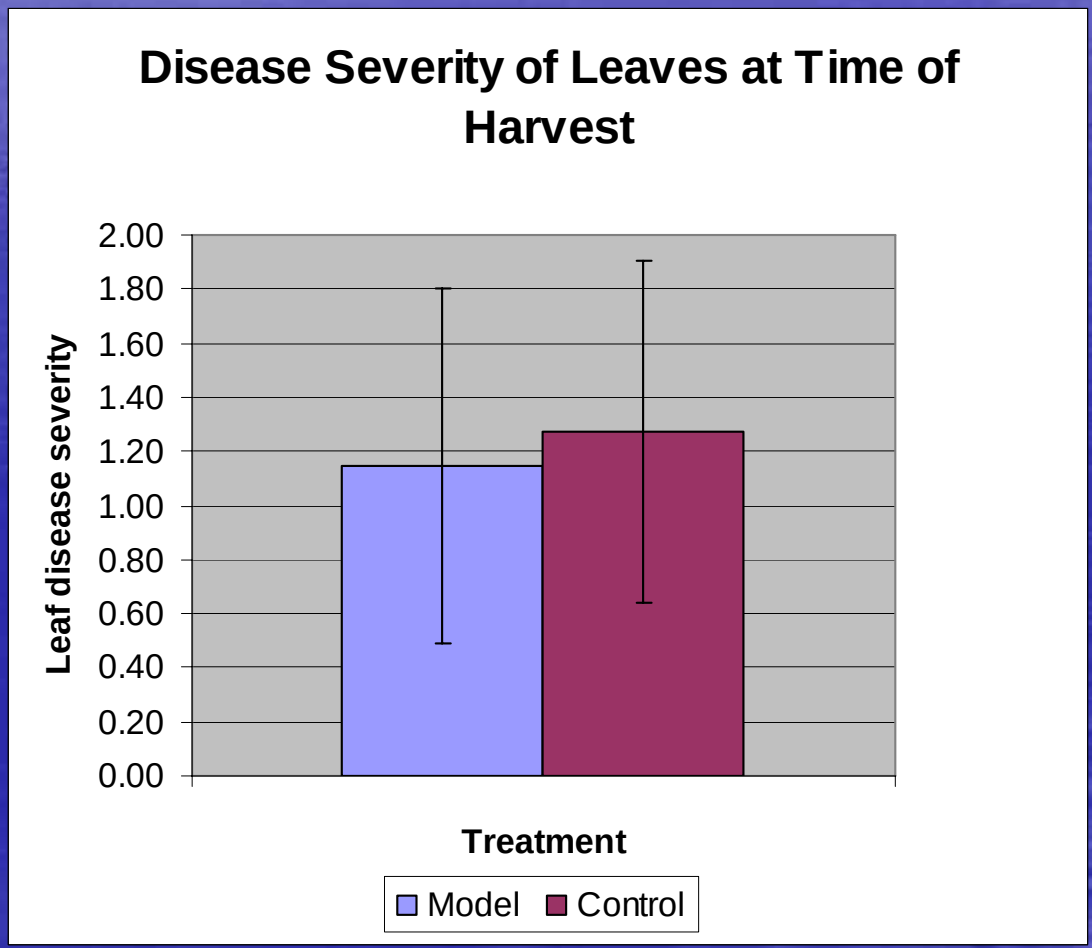




Results: Model Assessment

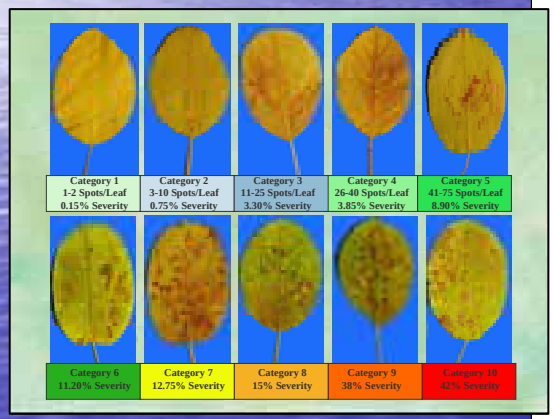
- Leaf Infection Rating at Time of Harvest:

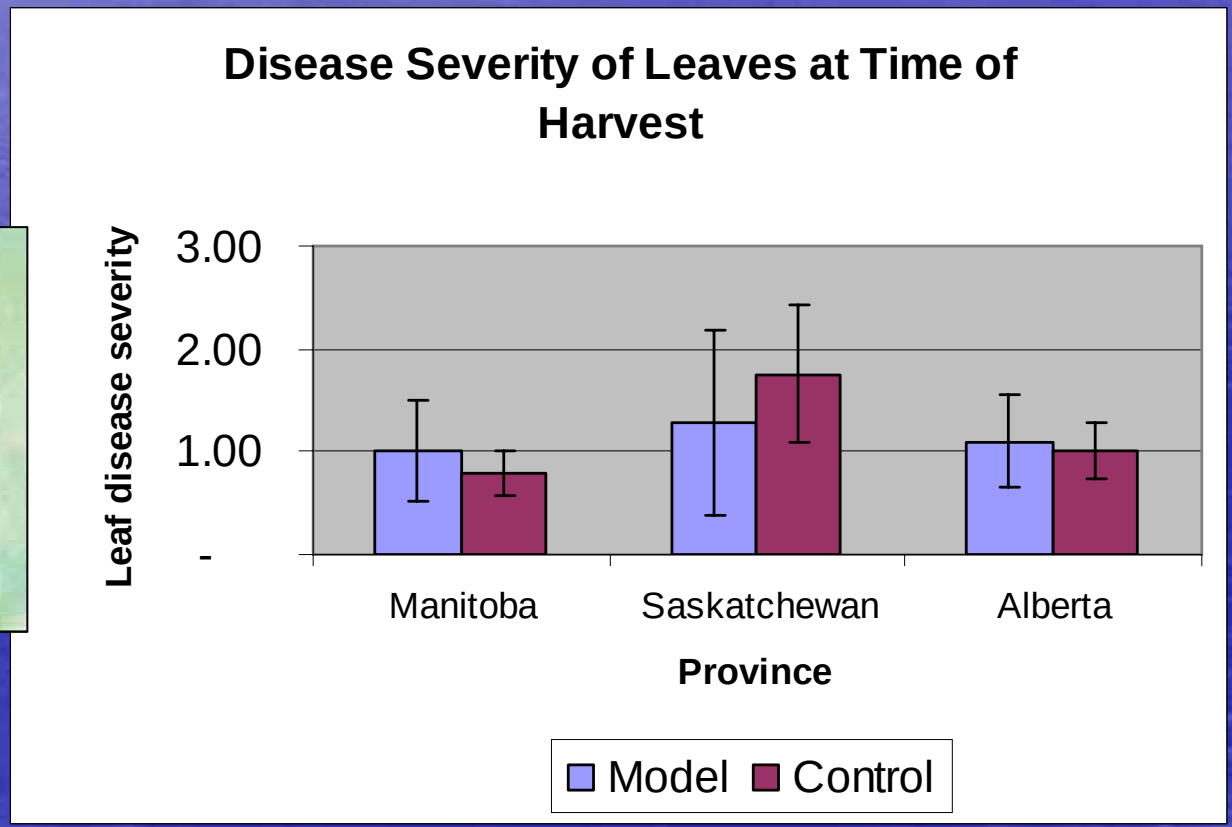




Results: Model Assessment

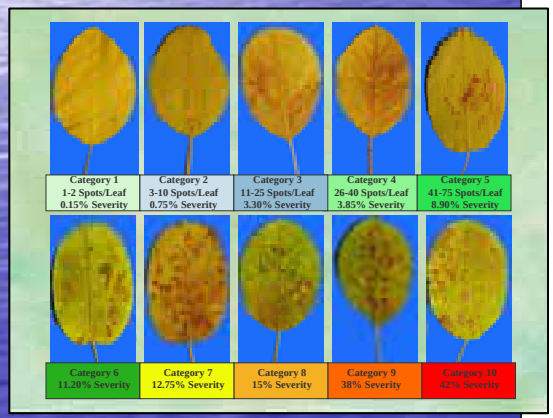
- Leaf Infection Rating at Time of Harvest ~ Province:

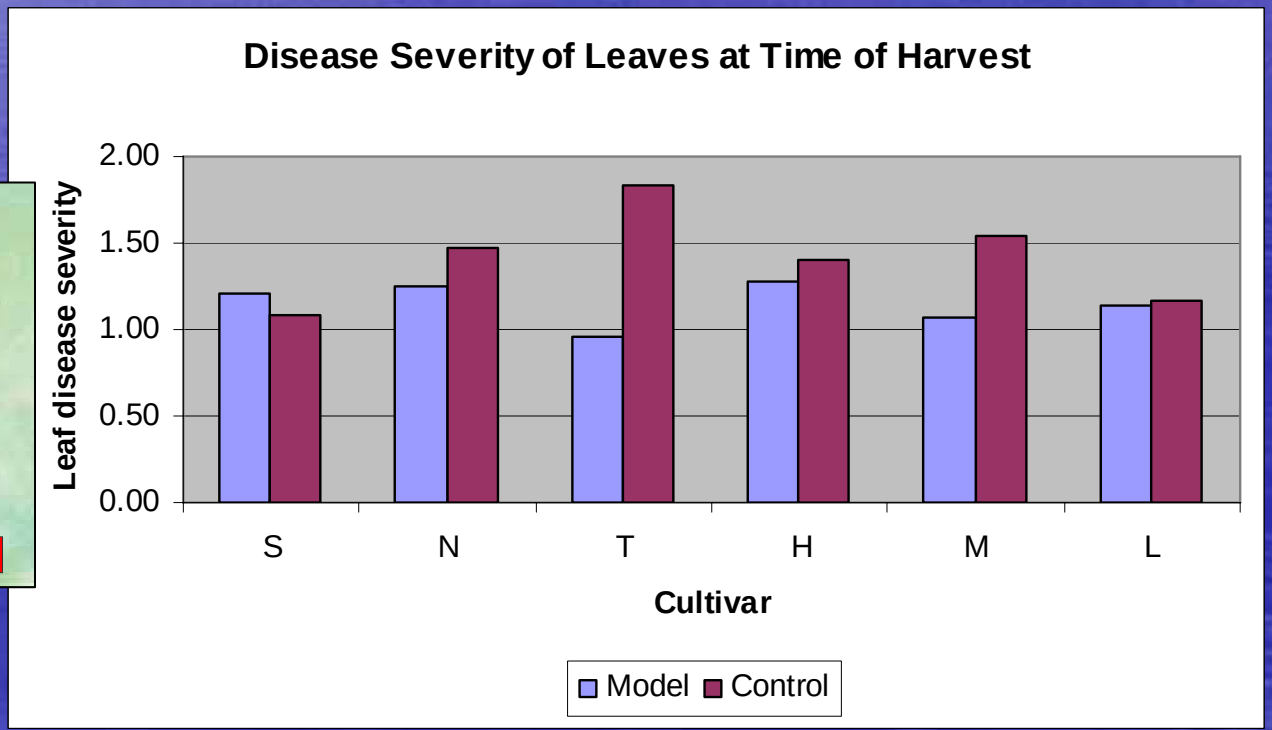




Results: Model Assessment

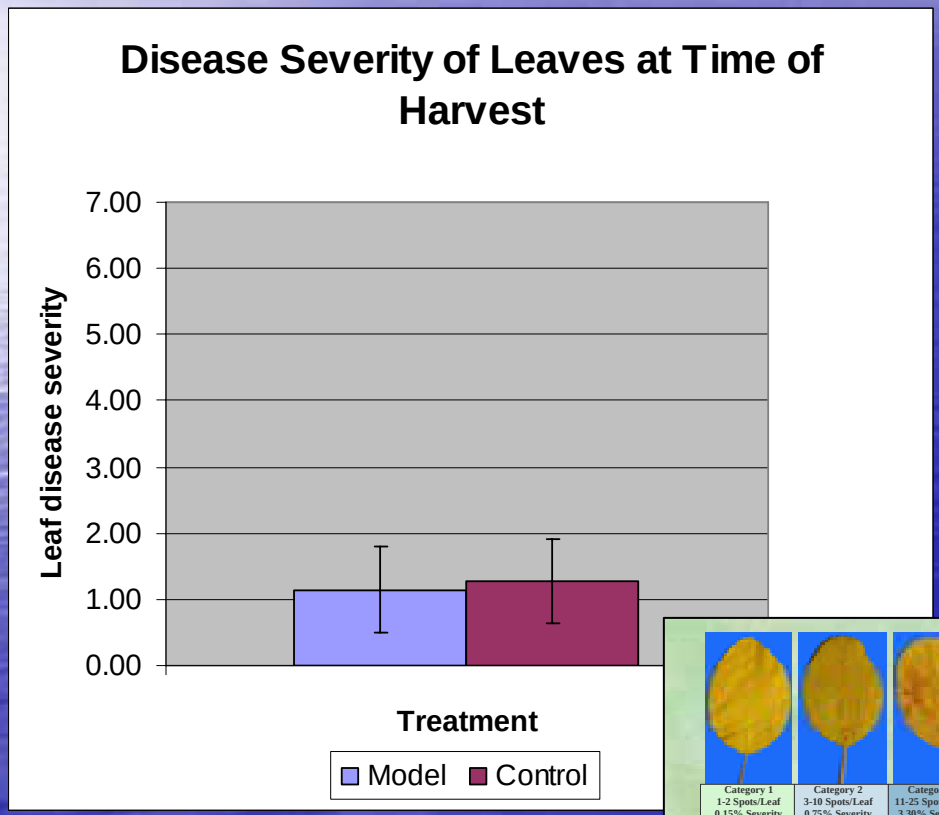
- Leaf Infection Rating at Time of Harvest ~ Cultivars:

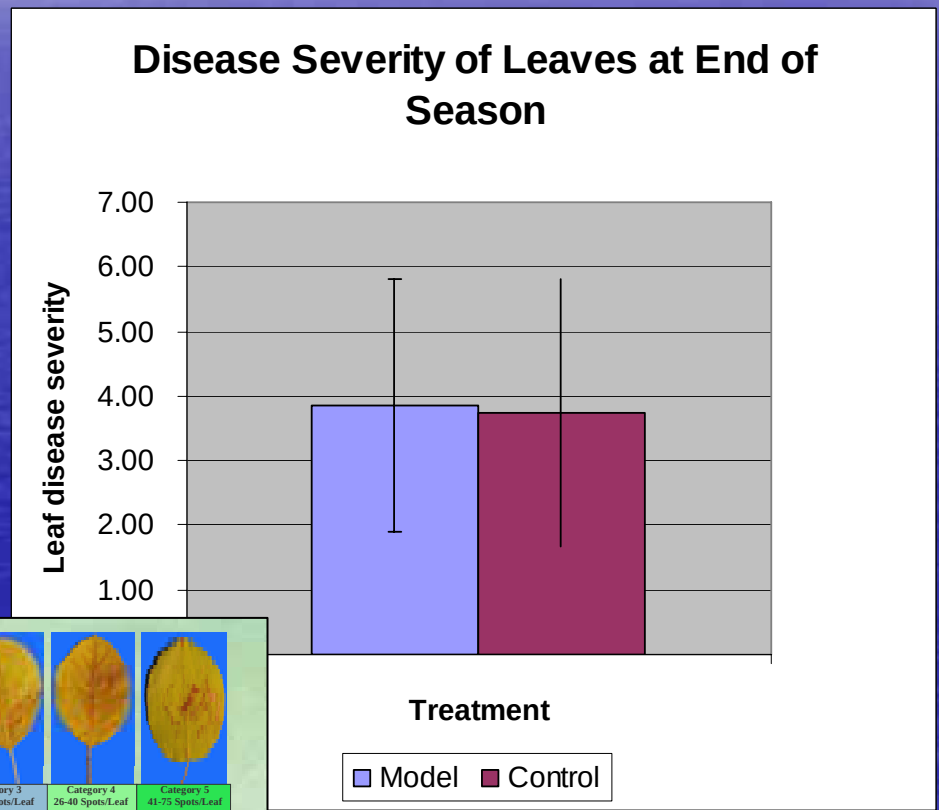


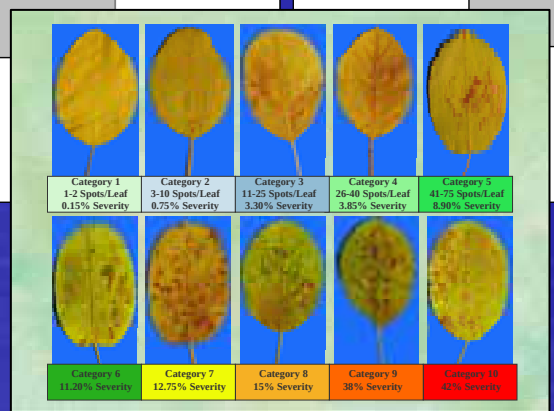


Results: Model Assessment

- Leaf Infection Rating at End of Season:

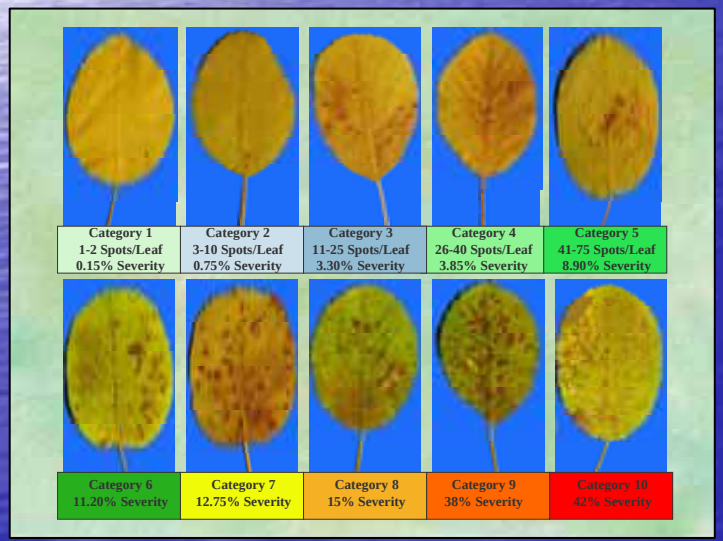


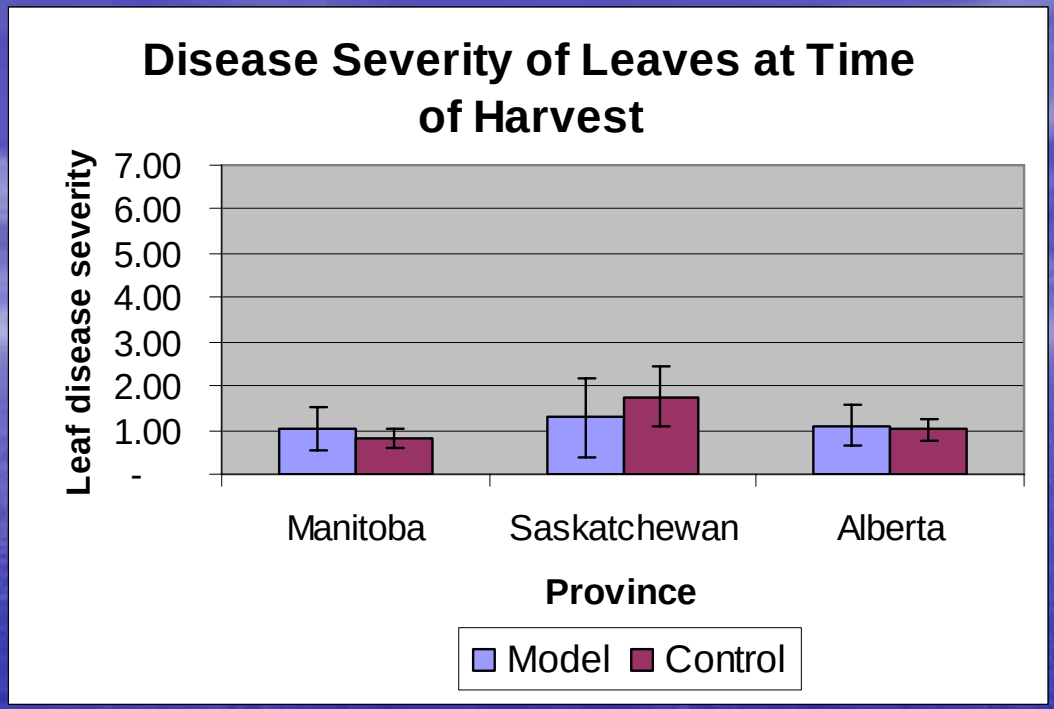


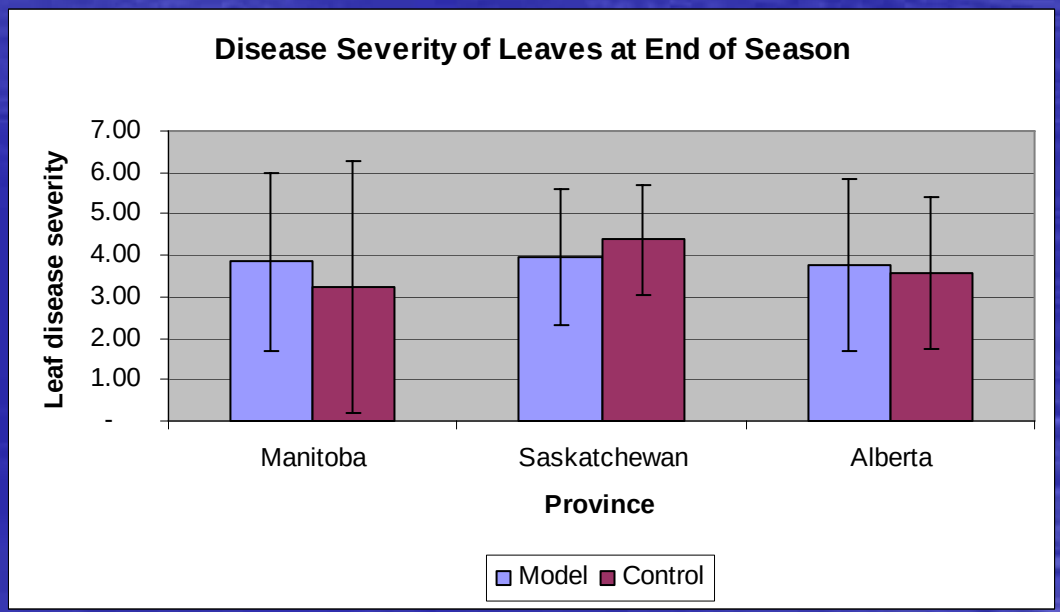


Results:

- Leaf Infection Rating at End of Season ~ Provinces:

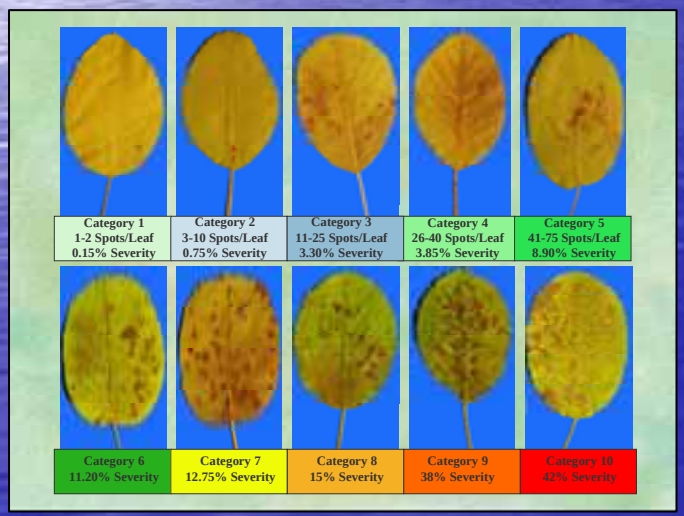


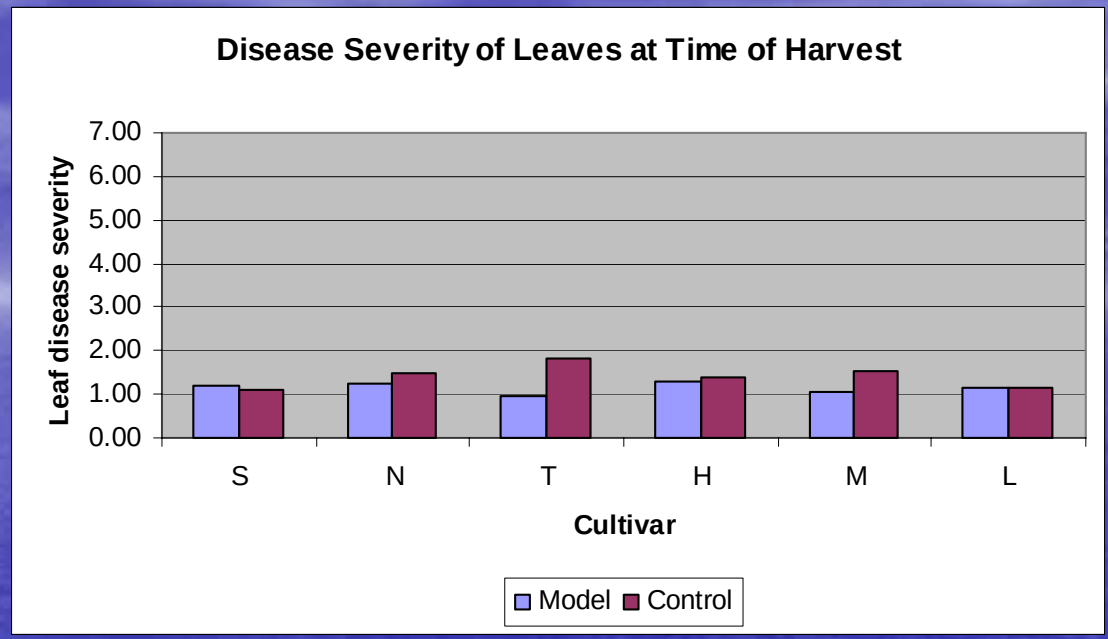


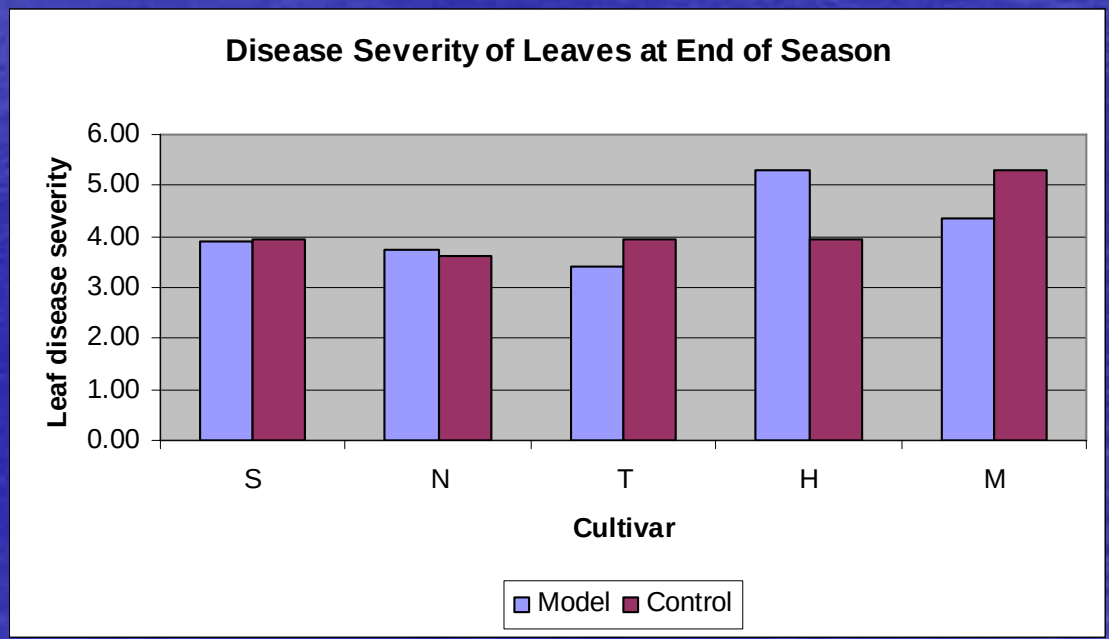


Results:

- Leaf Infection Rating at End of Season ~ Cultivars:







Results: Model Assessment

- **Summary:**
  - Fruit yield...
  - Were the models a success or failure?
    - Phenological model worked great
    - Reasonable disease control
      - Eradication was not expected

Results: Model Assessment

- **Summary:**
- For 2006 there was no significant difference between the model and control treatments:
  - Note: A number of growers just followed the model
  - Provinces
  - Cultivars
  - End of season disease severity**

  - Disease infection of fruit was not significantly different between provinces or cultivars
    - (SK>MB>AB)
    - Martin ~ Fruit / Thiessen ~ Leaf
  - Disease infection of leaves was not significantly different between provinces, cultivars or at the end of the growing season

Results: Model Assessment

- **CONCLUSION:**
  - The model should be effective for Smoky, Northline, Thiessen, Honeywood, and Martin in all three Provinces

Interesting Observations and Feedback

Interesting Observations and Feedback

Entomosporium leaf and berry spot

- Relatively dry year
- Infected bud tissue is primary over wintering inoculum source

Interesting Observations and Feedback

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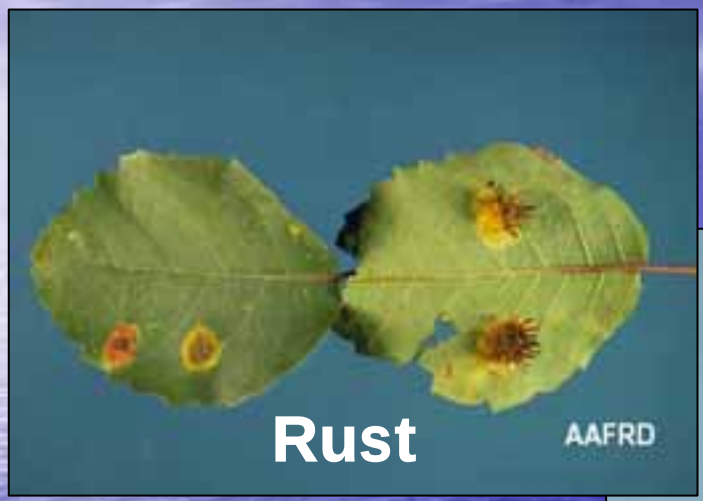
Interesting Observations and Feedback



Interesting Observations and Feedback

Interesting Observations and Feedback

Interesting Observations and Feedback

Interesting Observations and Feedback

Weeds

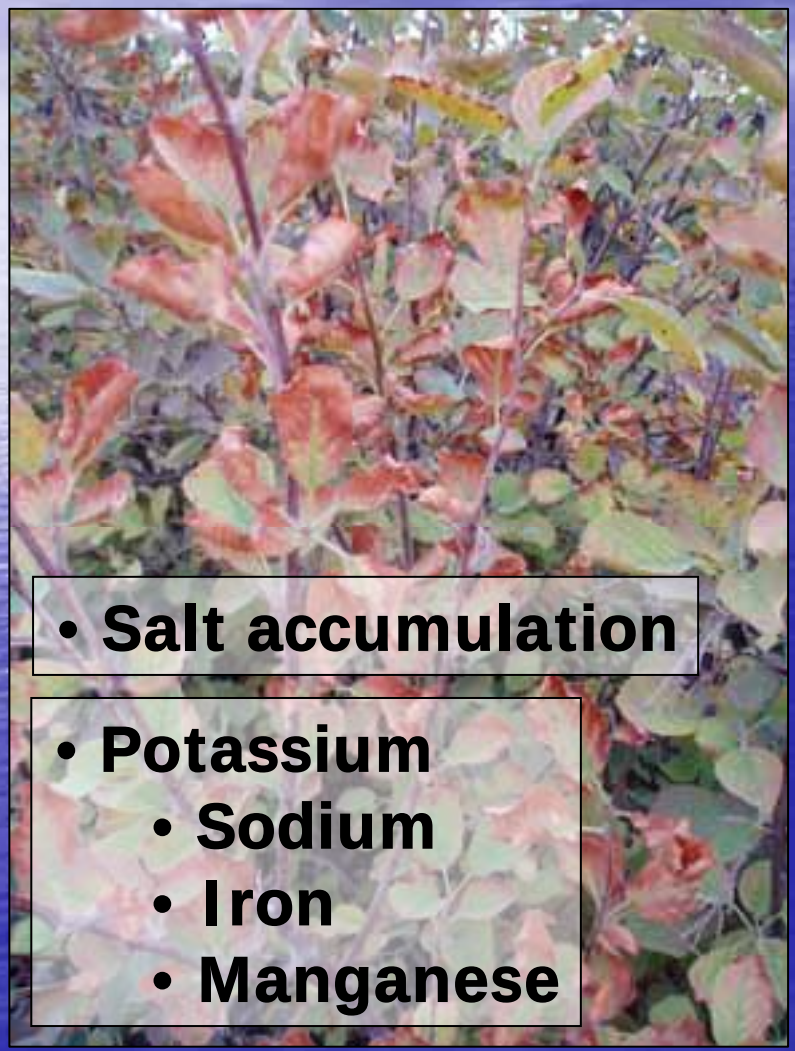
Interesting Observations and Feedback

2, 4-D Damage

Roundup Damage

Interesting Observations and Feedback

Interesting Observations and Feedback



- **Salt accumulation**
- **Potassium**
  - **Sodium**
  - **Iron**
  - **Manganese**

Nutrient Deficiencies

Interesting Observations and Feedback

Interesting Observations and Feedback

Future Work

Future Work

- **Need more grower participation**
- **One more year of field testing**
- **New website additions**
  - **Maps**
    - **Disease alerts**
- **Sponsorship….**

Future Work

- **Grower Feedback:**
  - "There is a great need to shorten the pre-harvest permissible application period of Topas 250E"
    - Potential need for after harvest application
  - "Not just between Provinces, there is a great need to share information between neighbors"
    - Disease notification, management practices....
  - "Strength in fixed pricing against larger organizations should be sought to ensure growth of all in the industry (large and small operations)"

Future Work

- **Grower Feedback:**
  - "If there is grant money available for starting an operation, that same money should be available to help already established orchards"
  - "Strengthen the market in our own back yard, and spend less energy and resources trying to acquire markets abroad"
  - "Team up to acquire export markets, strengthening the country's and grower group's marketing dollar"

Future Work

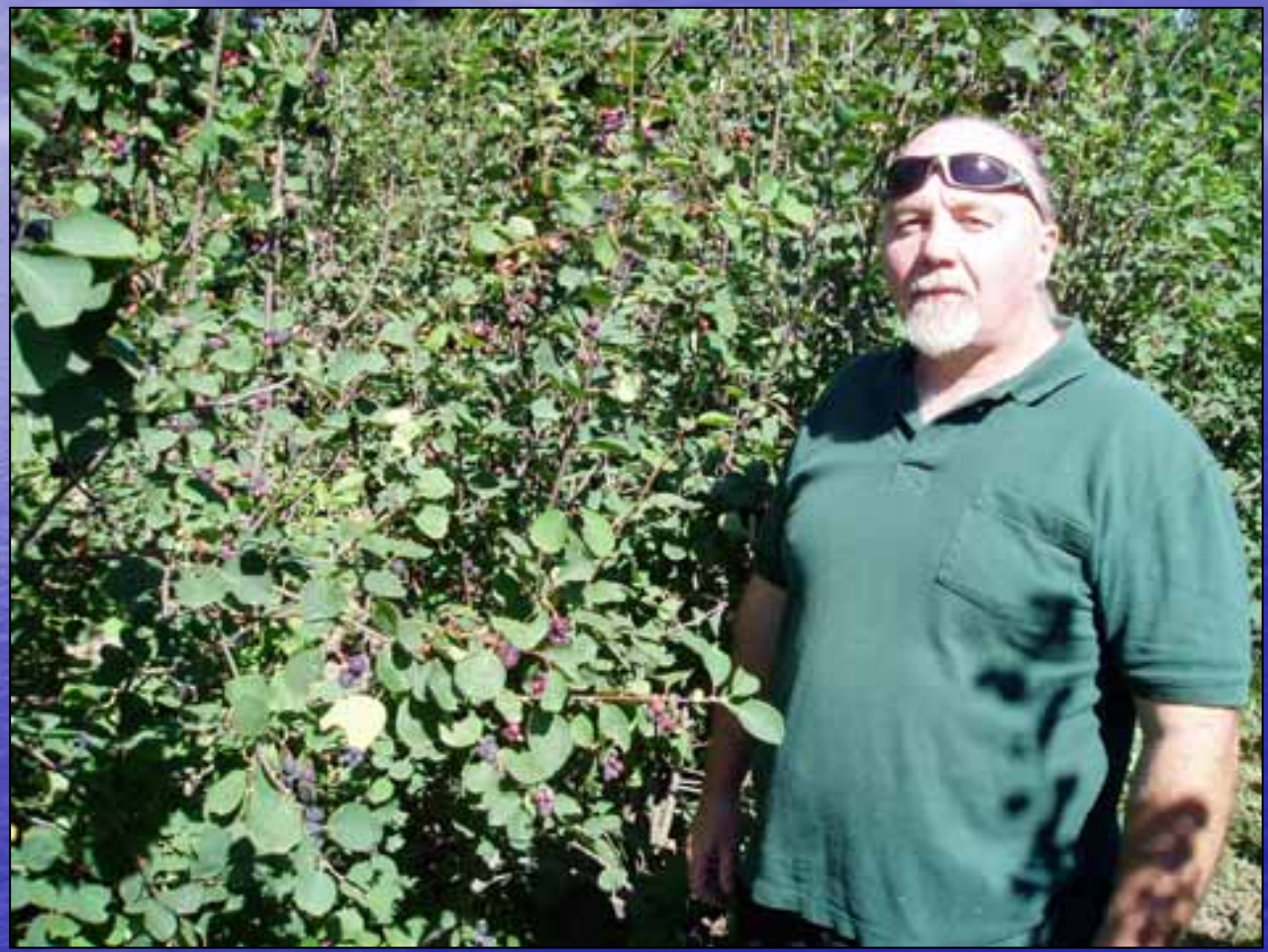
- **Grower Feedback:**
  - "What insect is responsible for fertilizing Saskatoon plants, if we can identify it then it could potentially help improve fruit set"
  - "There is a need for a 3rd party marketing body for the industry"
  - Plants should not be placed 18 inches apart when planting, but rather 3 to 4 feet apart as this seems to reduce competition, encourage vigorous growth and fills in rows within 5-6 years"

Acknowledgements

- **PFGA**
- **SFGA**
- **FGSA**
- **MRAC**
  - **Advancing Canadian Agriculture and Agri-Food**
- **Producers**


kaloon Berry
U-Pick


HONDA




Riverbend
Plantation


WARMAN
BERRY RANCH
OPEN
PRIVATE PARKING


Saskatoon Valley
Orchards
U-PICK
Home of
PKT Morgans
963-8311
OPEN