Evaluation of Parent Plants for Alfalfa Breeding

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Structure

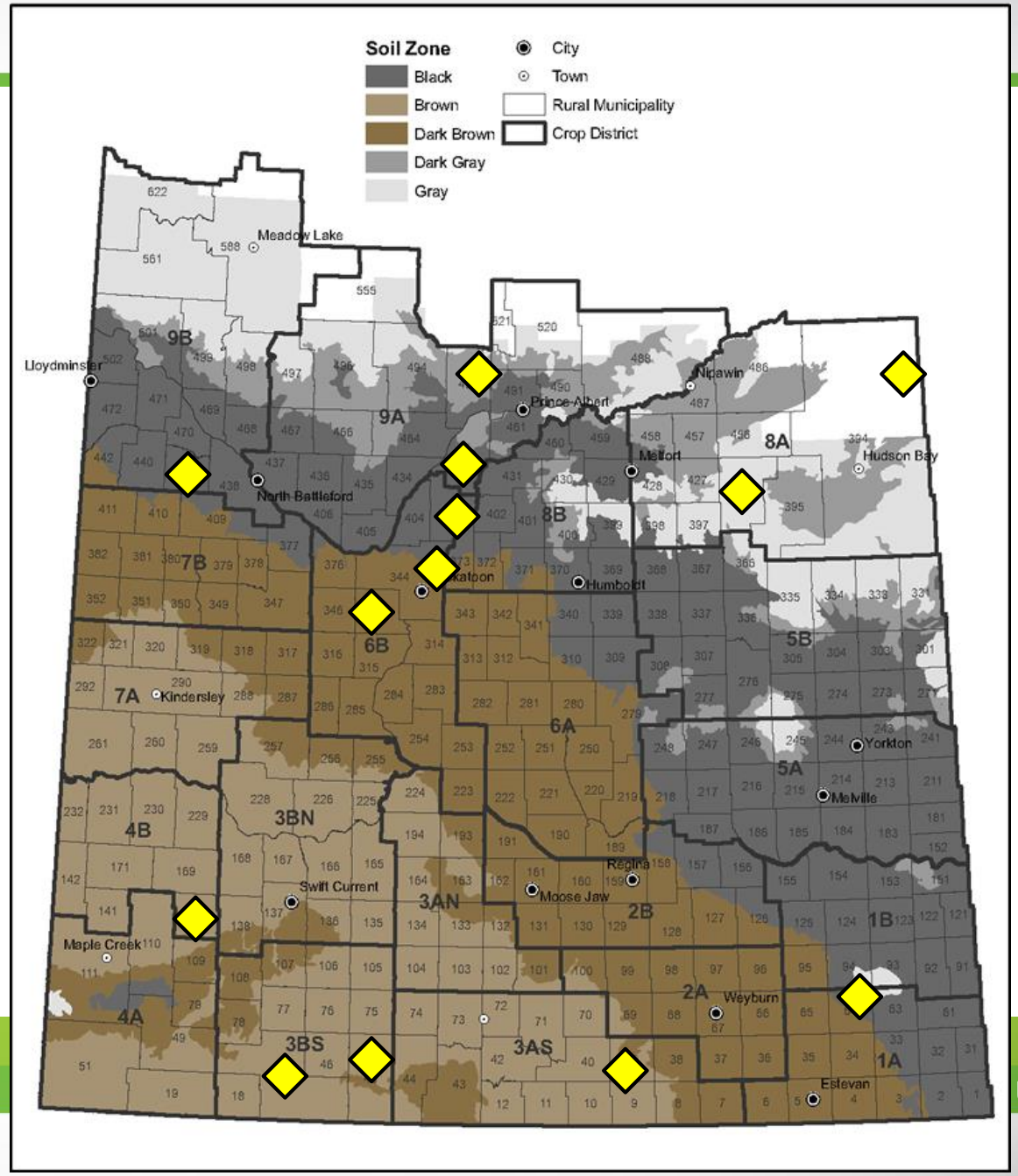
- Background
- Experimental Design
- Experiment 1: Soil Sample Study
- Experiment 2: Morphological Study
- Experiment 3: Forage Quality Study
- Experiment 4: Verticillium Wilt Disease Analysis

Alfalfa (*Medicago sativa* L.)

- Legume
- Widespread in temperate regions (Rumbaugh et al., 1988; Iannucci et al., 2002)
- High performance animal feed used for grazing or stockpiled feed (Smith et al., 2000)
- Stand persistence is economically important (Wright, 1976)
- Breeding objectives: persistent and locally adapted cultivars

Background

- 25+ year alfalfa stands
- 4 soil zones
- 13 sites



Each Site Has a Different History

Rockhaven – Black Soil Zone

Erwood – Grey Soil Zone

Shellbrook – Grey Soil Zone

From Field to the Greenhouse

Experimental Design

- Randomized Complete Block Design (RCBD)
  - 13 Populations
  - 4 Replications
  - Each population has 3 plants/rep

Experiment 1: Soil Sample Study

- Hypothesis 1: Soil characteristics of the 13 sites will be similar.

- Soil sampled at 11 sites
  - ALS Laboratory Group Agricultural Services in Saskatoon, SK

Experiment 1: Soil Sample Study

Site Name	Soil Zone	Soil Texture
Crooked River	Grey	Loam
Shellbrook	Grey	Loam
Erwood	Grey	Loam
MacDowall	Black	Loam
Duck Lake	Black	Sandy Loam
Rockhaven	Black	Loam
Arcola	Black	Loam
Ceylon	Brown	Loam
Gull Lake	Brown	Loam
Val Marie	Brown	Loam
Moose Jaw	Brown	Loam
Dalmeny	Dark Brown	-
Pike Lake	Dark Brown	-

Experiment 2: Morphological Study

- Hypothesis 2: Morphological characteristics will be similar among populations derived from the same soil zones.
- Morphological Data Collection
  - Height and Regrowth Height
  - Flower Colour
  - Presence of Red Stem
  - Multifoliate Leaf Expression
  - Dry Matter Yield (DMY) and Regrowth DMY

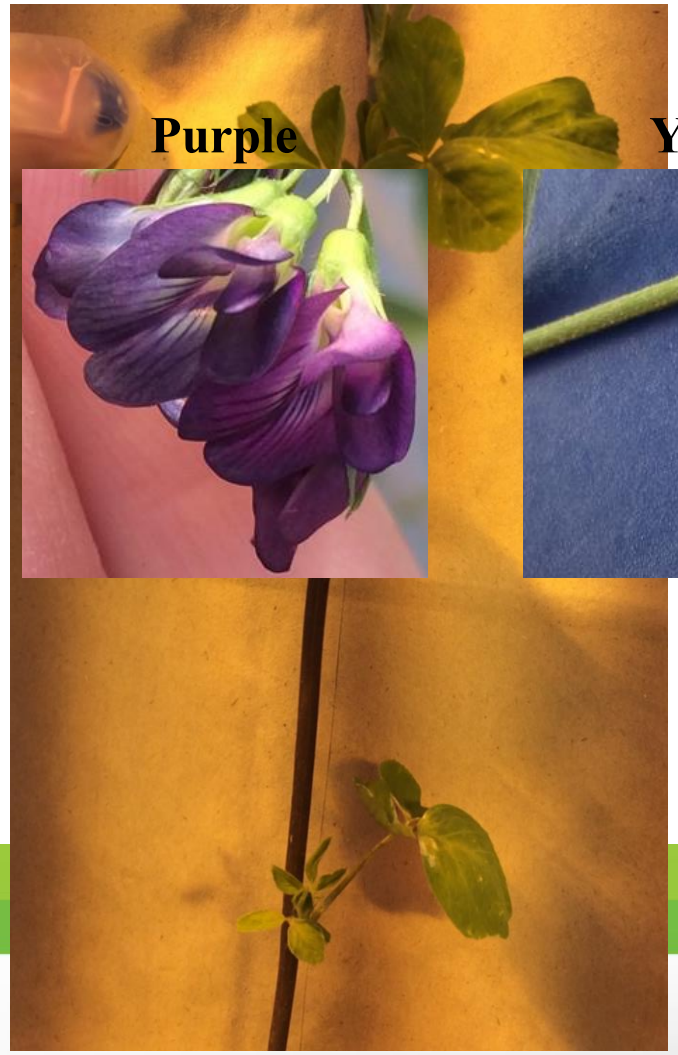
Experiment 2: Morphological Study

- Flower Colour

Cream

Light Purple

Purple



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- Trifoliate Leaf Expression
- Presence of Red Stems

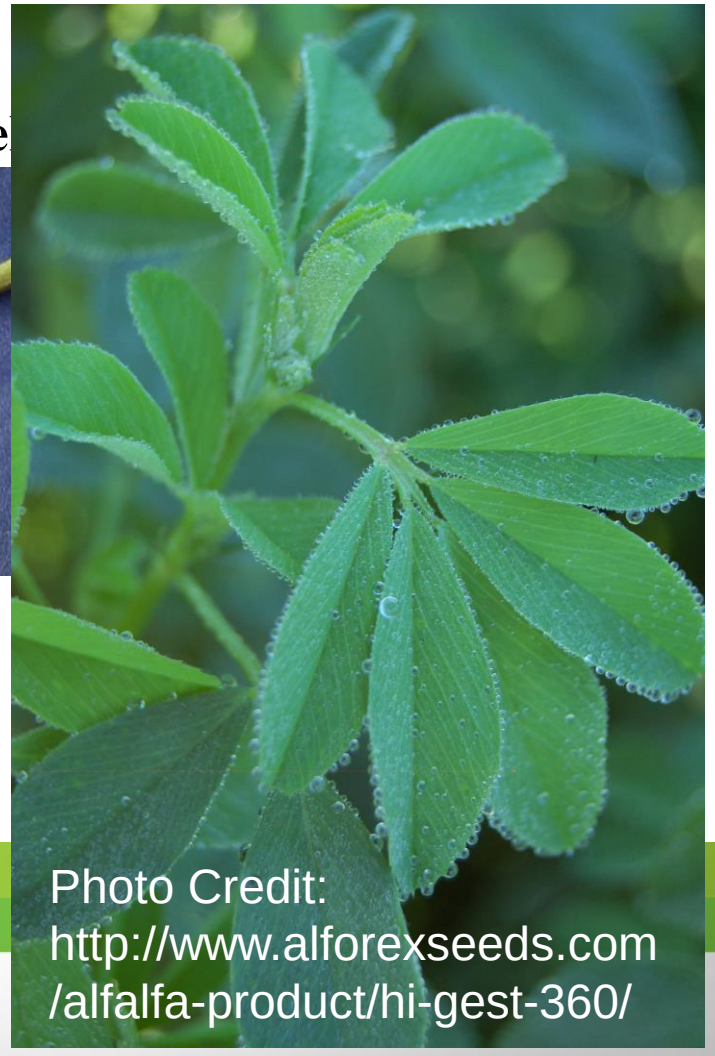
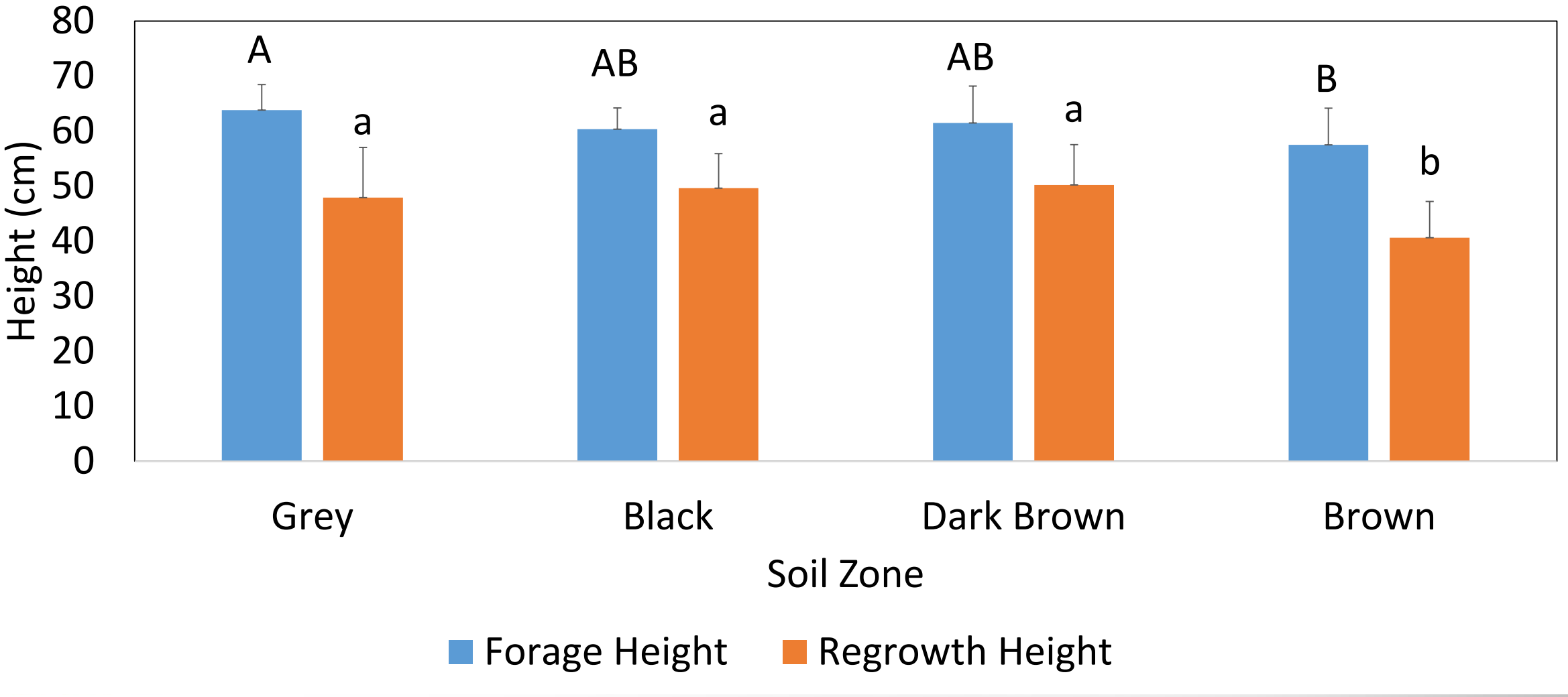


Photo Credit:
http://www.alforexseeds.com
/alfalfa-product/hi-gest-360/

Experiment 2: Morphological Study



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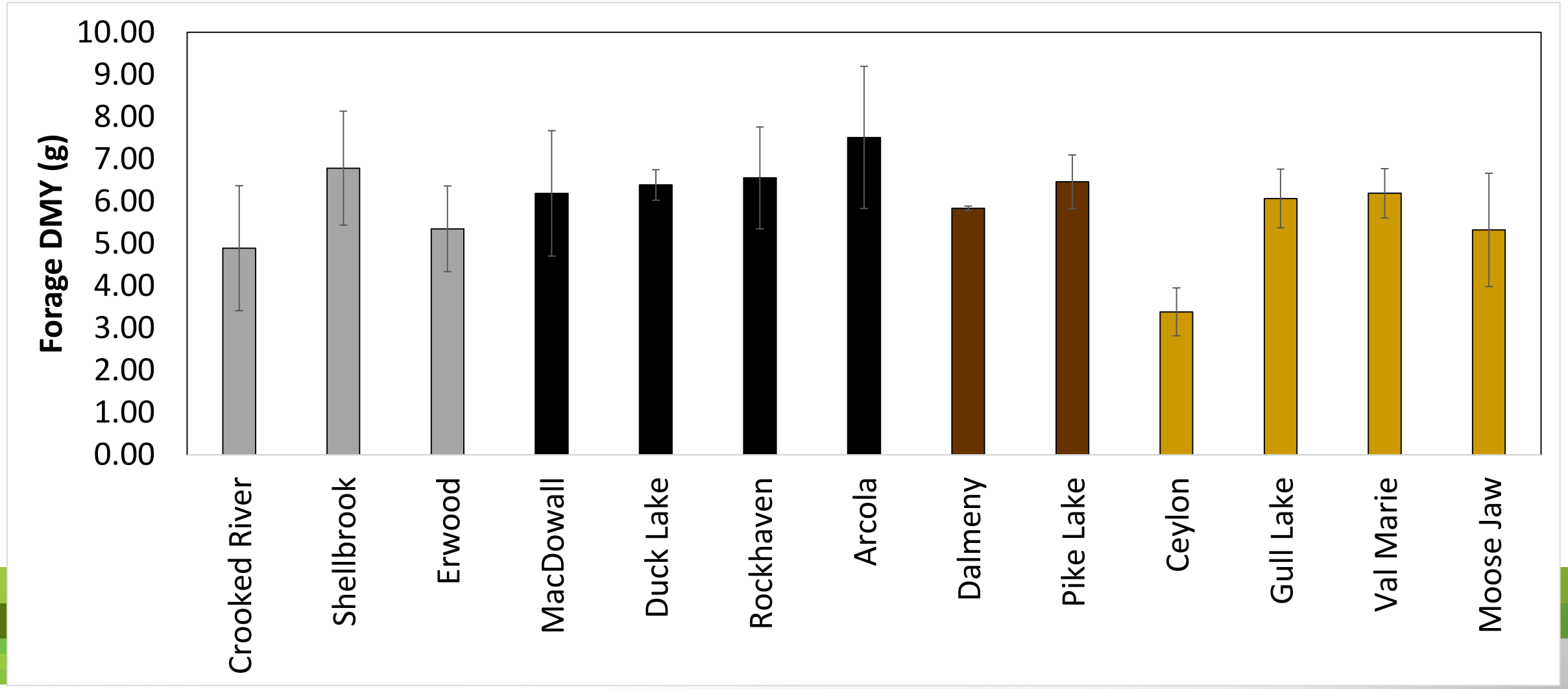
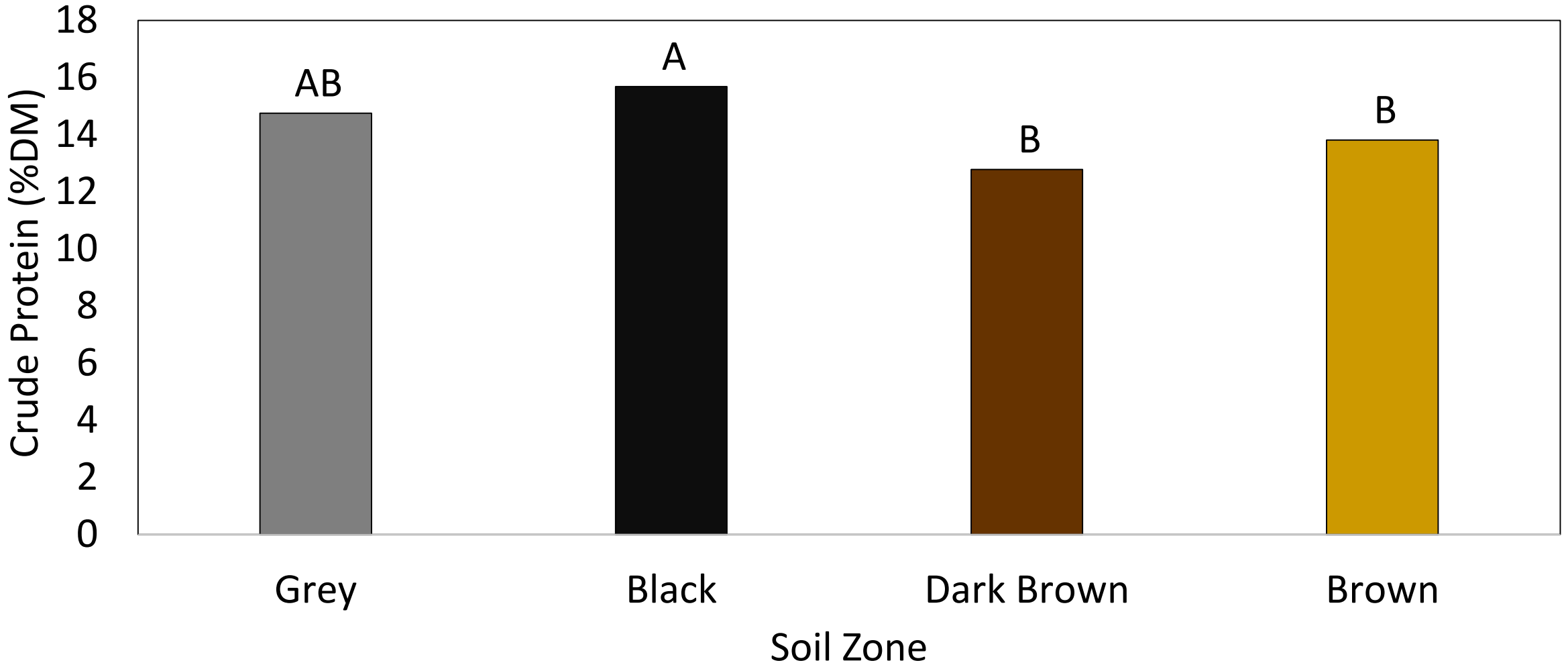


Experiment 3: Forage Quality Study

- Hypothesis 3: Forage quality characteristics will be similar among populations derived from the same soil zones.

- Forage Quality Analysis
  - Crude Protein (CP) - Leco 628 Element Analyzer
  - Acid Detergent Fiber (ADF) and Neutral Detergent Fiber (NDF) - Ankom^{2000} automated fiber analyzer

Experiment 3: Forage Quality Study

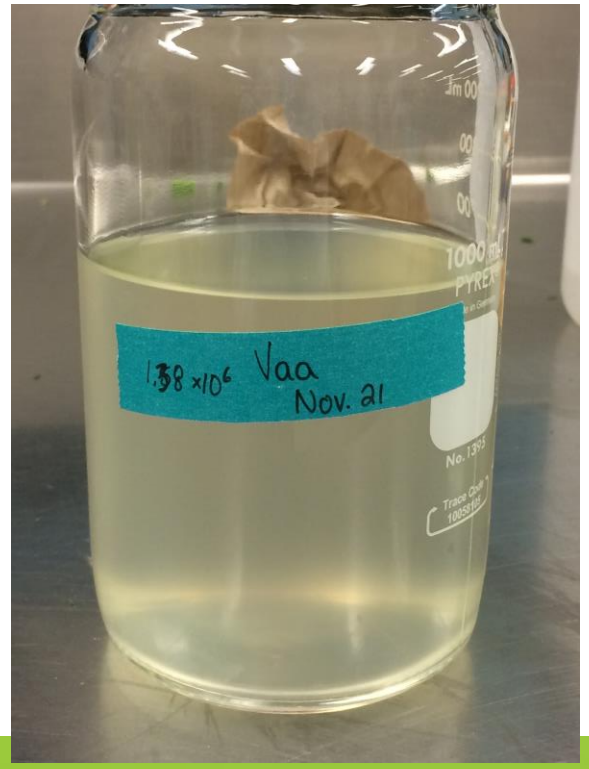


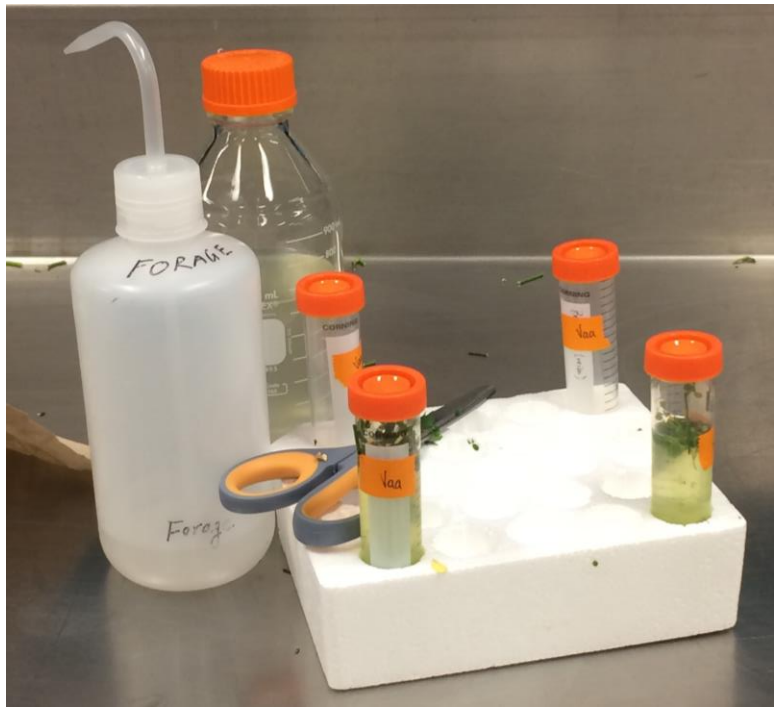
Experiment 4: Verticillium Wilt Disease Analysis

- Hypothesis 4: Populations of alfalfa from the black soil zone should be more resistant to *Verticillium albo-atrum* than populations of alfalfa from other soils zones in Saskatchewan.

Experiment 4: Verticillium Wilt Disease Analysis

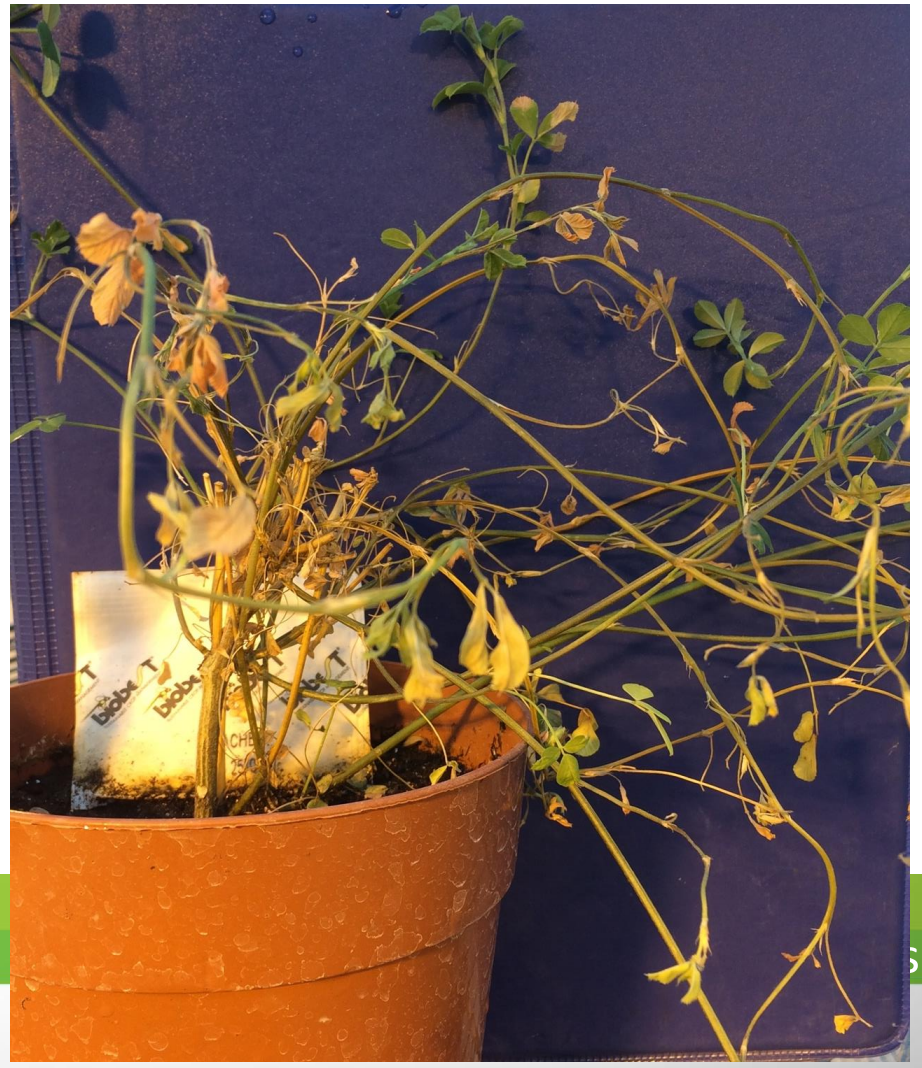
- Spore Suspension: 1.38 x 10^6 conidia spores/ml water
- Stubble Spray Inoculation





Experiment 4: Verticillium Wilt Disease Analysis

- Visual symptoms evaluated
  - Leaflets had V-shaped yellow or pink chlorosis
  - Dry or pink colour of stems



Conclusions

- Optimal soil characteristics are important for ensuring the longevity of an alfalfa stand
- Forage characteristics vary between and among alfalfa populations
- Forage characteristics should be evaluated based on physiological growth stage
- A higher concentration of conidia spores should be used in a Verticillium wilt disease study
- In plant breeding, one can never collect too much data

Acknowledgements

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