

Managing Verticillium Wilt in Potatoes with Mustard Biofumigation



mbpotatoresearch.ca – Research Reports

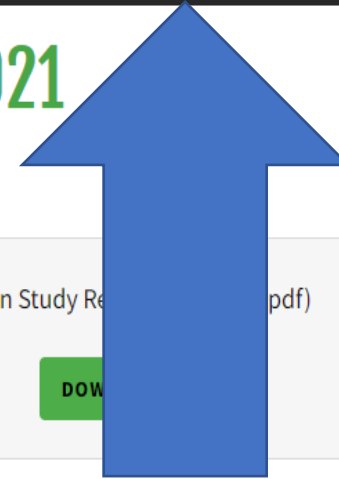
NEW REPORTS 2021

MHPEC Sulfur Study Report 2021 V1.7 (pdf)

DOWNLOAD

Nitrogen Study Report 2021 V1.7 (pdf)

DOWN



REPORTS 2019-2020

2020_CMCDC-Annual-Report (pdf)

DOWNLOAD

2020-Potato-Magazine (pdf)

DOWNLOAD

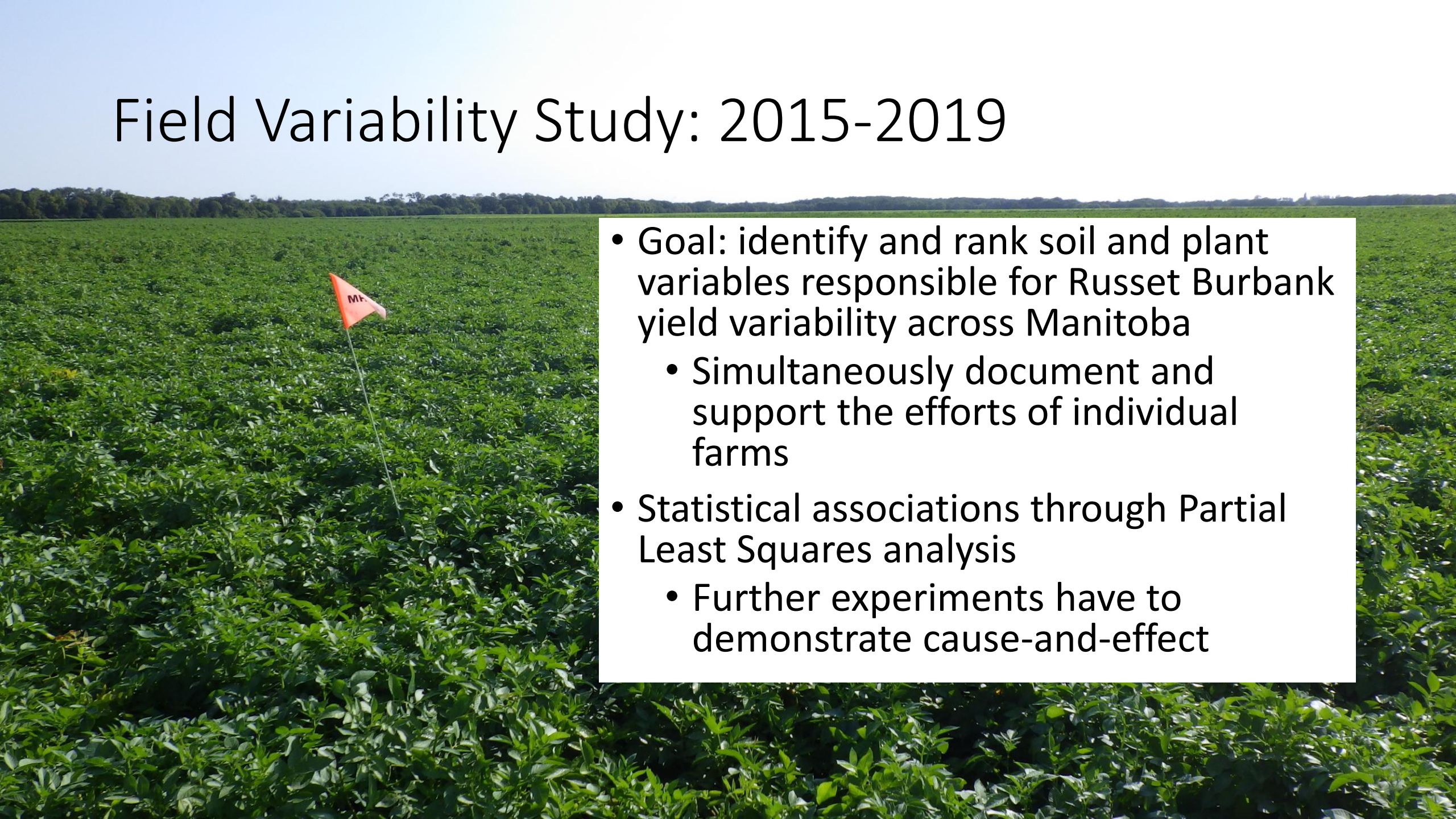
2020 Mustard Biofumigation Report (pdf)

DOWNLOAD





Field Variability Study: 2015-2019

- 
- Goal: identify and rank soil and plant variables responsible for Russet Burbank yield variability across Manitoba
 - Simultaneously document and support the efforts of individual farms
 - Statistical associations through Partial Least Squares analysis
 - Further experiments have to demonstrate cause-and-effect

Field Variability Study

Approximately 50 of 98 independent variables have been associated with yield variability with five years of data (23 fields), and the effect of each variable has been ranked in order of significance



Field Variability Study

The top three most significant sources of yield variability:

- 1. Verticillium wilt propagules in soil. The yield of over 10 oz tubers decreases as propagules rise over 30 per gram of soil**
2. Too little soil and petiole nitrogen at row closure. The percentage of yield that is 6-12 oz tubers appears to decrease when the soil has less than 120-130 lbs of N in a soil test.
3. Too little soil sulfur at row closure. The percentage of yield that is 6-12 oz tubers appears to decrease when the soil has less than 30 lbs of S in a soil test.



SEP/ 4/2015



Mustard Biofumigation

- One possible management strategy for Verticillium wilt
- Focus on Mustard because:
 - Many Manitoba growers are in an early stage of epidemic
 - Growers want cost-effective option for early stage
 - Many growers under 10 microsclerotia/gram of soil required to infect potato
 - Many growers have 40-80 microsclerotia/gram of soil – over threshold, hard to notice Vert outbreak if managing other issues
 - Few growers have 100-300 microsclerotia/gram of soil – over threshold, noticeable dead patches and yield loss in Burbank fields
 - Very few growers over 600 microsclerotia/gram of soil – situation becomes complicated because these growers use Verticillium resistant cultivars and/or harvest early

Mustard Biofumigation

- Data from today stems from one mustard cultivar: Caliente Rojo from High Performance Seeds
 - Caliente mustards bred for biofumigation, come with decades of research to support biofumigant potential for Verticillium wilt management



Mustard Biofumigation

- Haider and I are exploring other potential biofumigant mustards
 - Example: AAC Brown 18, a hybrid mustard from M21
 - Other mustards can theoretically be used for biofumigation
- **Very important:**
 1. **Not all mustards possess equivalent biofumigation potential**
 2. **Choosing correct mustard with incorrect method will lead to unsuccessful biofumigation**
 3. **Make sure your mustard and your method are experimentally verified in regional research**

Mustard Biofumigation

- Biofumigation Recommendations for Manitoba

Use of treated seed for flea beetles (Senator, others)

Planting date

- If grain crop precedes mustard: plant in late July and biofumigate in October
- If just mustard: plant in June (avoid flea beetles) and biofumigate in August
- Two successful crops can be raised in a single season
- Successful crop: 5-foot plants, 60-80 kg/m² (~270-360 US tons per acre)



Mustard Biofumigation

- Biofumigation Recommendations for Manitoba

Planting method

- Drilling seed most effective, rate 6-8 lbs/acre, 3/8 inch deep

Fertilizer

- 120-180 units N recommended, 70-90 units N at plant, remainder fertigated
- Begin fertigation after 30 days, fertigate 20-25 units of N per application and 5 units of S
- At least 30 units S recommended (adjust to 6:1 nitrogen to sulphur fertilizer ratio)
- Fertilizer rates main area of focus in 2022 research program

Irrigation

- 8 inches total, 4-5 inches done in first month to keep seedbed moist
- Biggest impediment to widespread adoption

Incorporation technique

- The crop must be flailed, incorporated immediately (<10 mins)
- The ground should be sealed – rolled, moisture



Mustard Biofumigation

- Two-part experiment:
 - Method to achieve maximum biomass on offsite and in field (with Haider Abbas)
 - Demonstrate biofumigation reduces Verticillium wilt in field



Mustard Biofumigation



Mustard Biofumigation



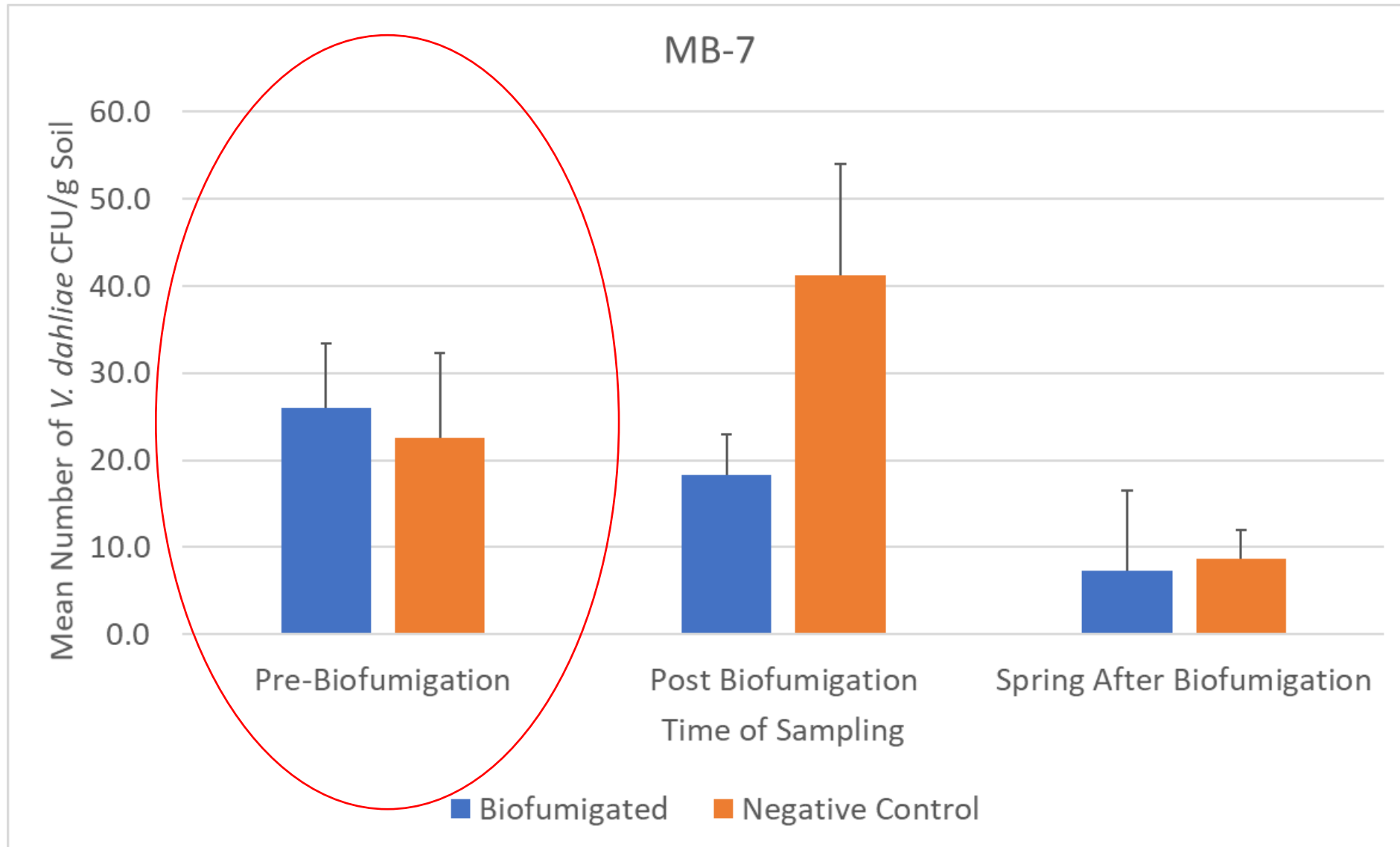
Mustard Biofumigation



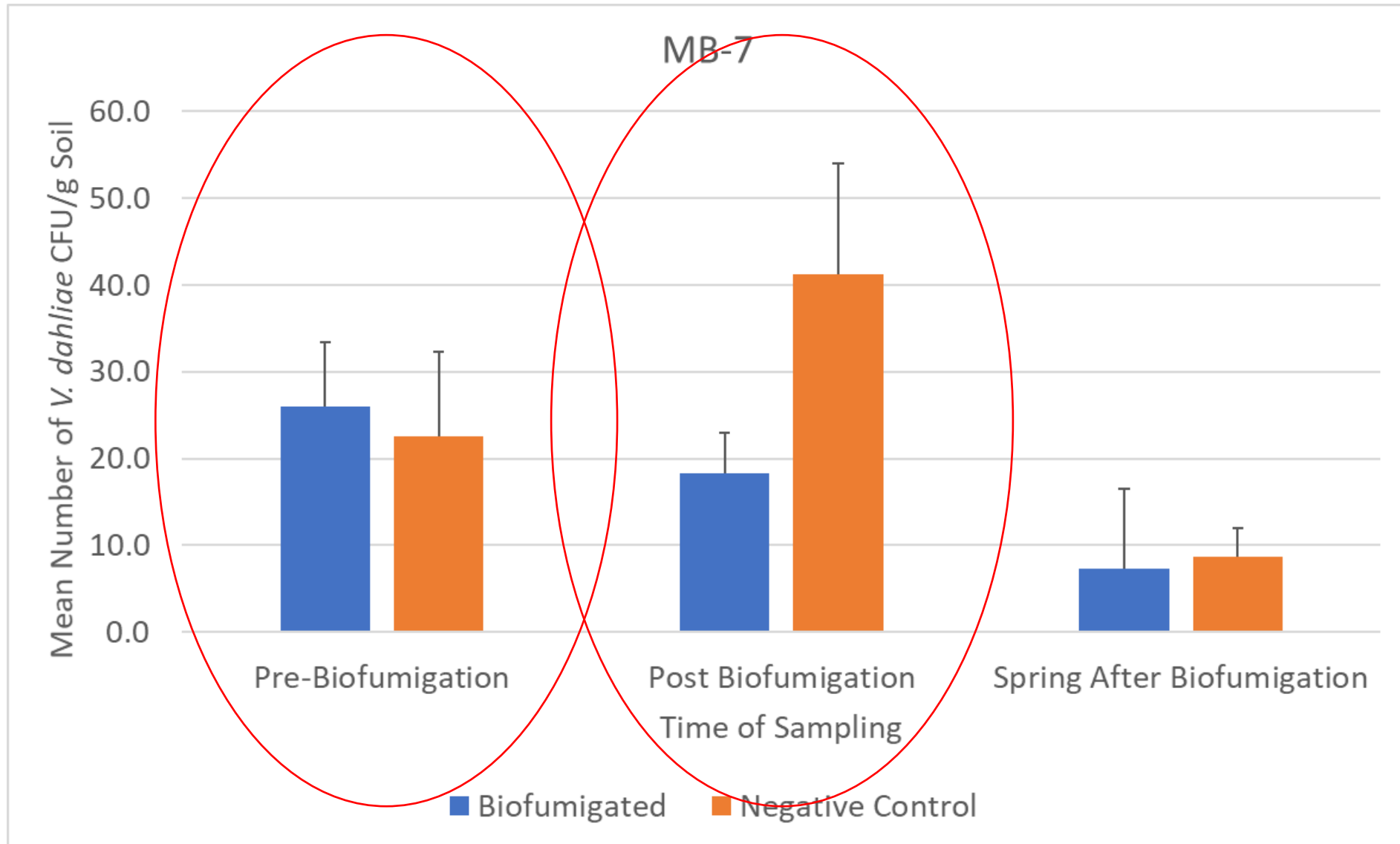
Mustard Biofumigation



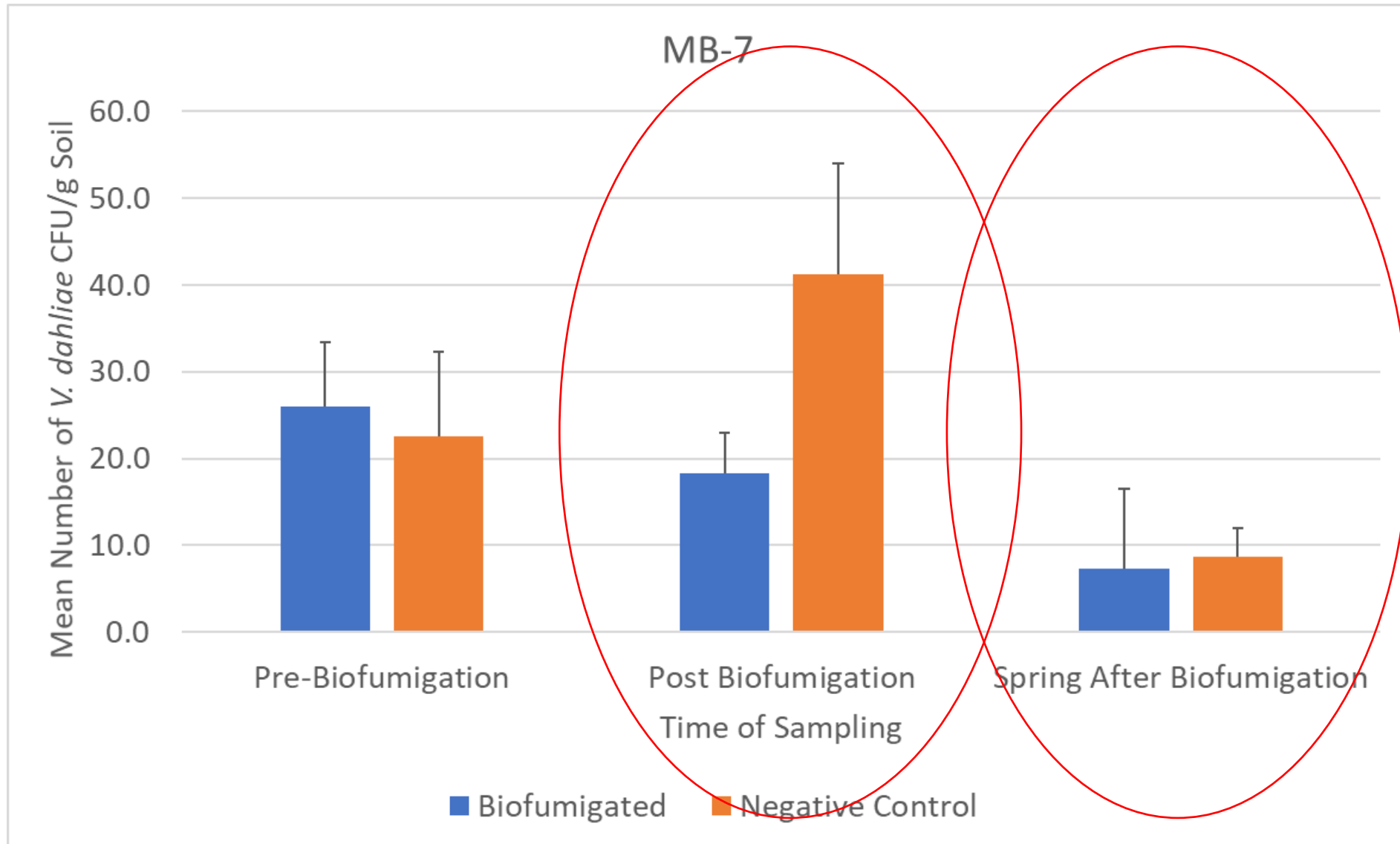
Mustard Biofumigation



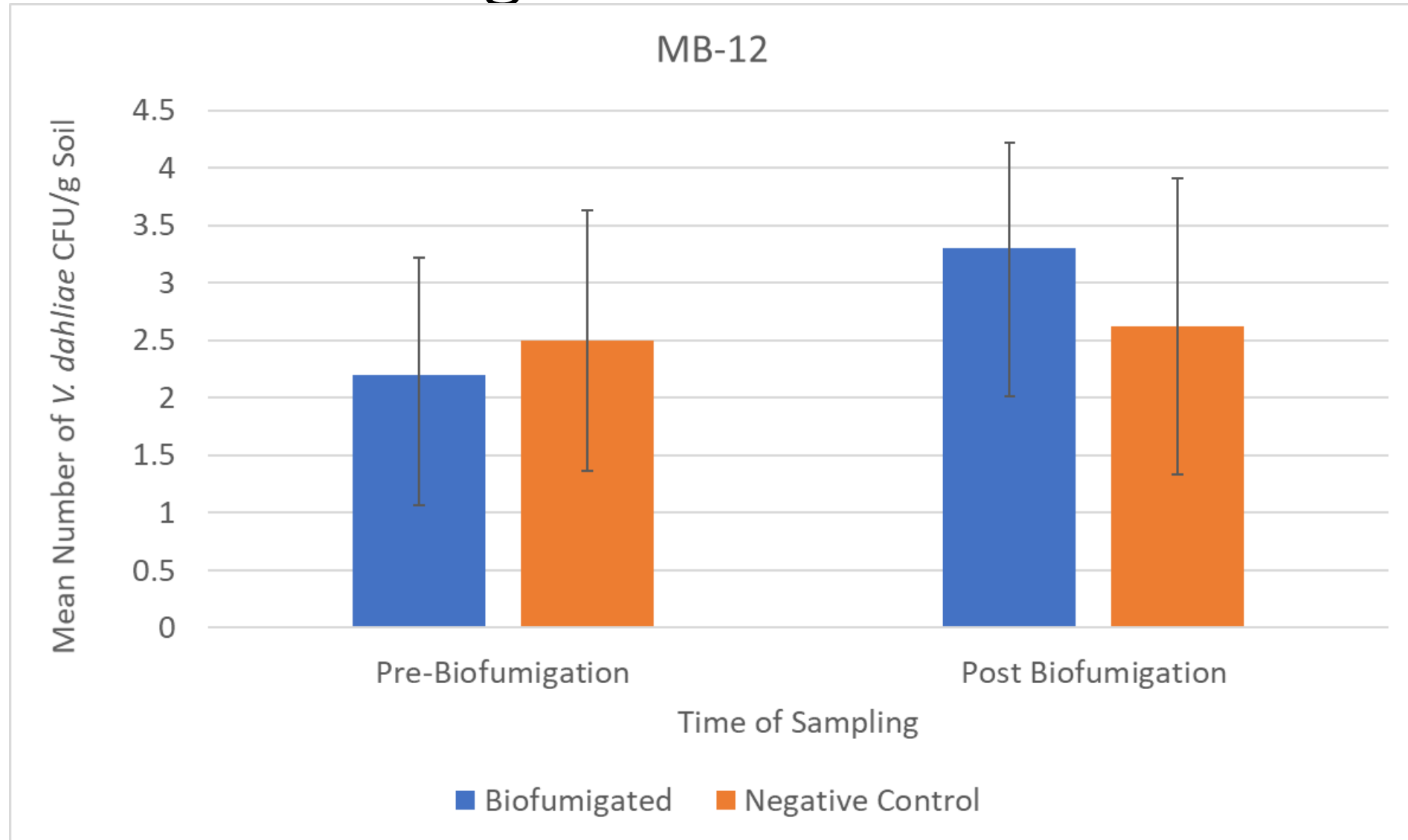
Mustard Biofumigation



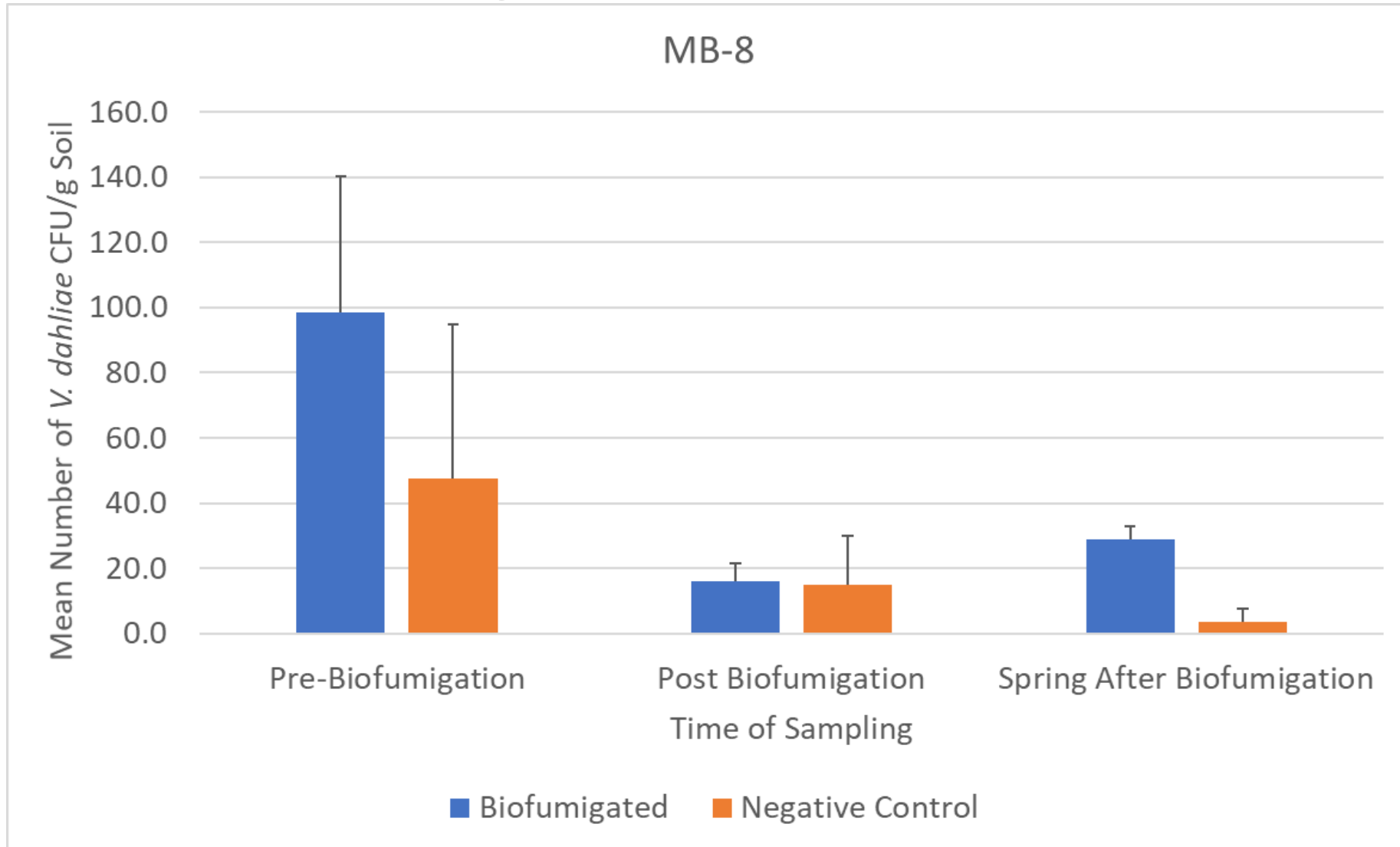
Mustard Biofumigation



Mustard Biofumigation



Mustard Biofumigation



Mustard Biofumigation

- Future research
 - Complete original objective to determine if Caliente Rojo biofumigation is a cost-effective Verticillium wilt management tool
 - Includes protocol for max biomass and demonstrate *V. dahliae* CFU/wilt reduction
 - Includes identifying reasons for outliers – suppressive soil, other grower activity potentially reducing/moving *V. dahliae*
 - Begin evaluation of additional mustard for biofumigant potential (AAC Brown 18 from M21, others)
 - Includes potential of dryland Caliente, AAC Brown 18, or other mustards as tools for wind erosion reduction, common scab management

Funding Sources + Partners

- MHPEC Members (KPPA, McCain, Simplot)
- Grower collaborators + CMCDC staff
- High Performance Seeds and M21
- Manitoba strategic initiative
- Canadian Agricultural Partnership, Ag Action Manitoba Program #1000210208 and #1000239308



Questions/Comments?

- Email: mhpec@outlook.com
- Website: mbpotatoresearch.ca
 - Research reports available
- Additional CMCDC materials:
 - Diversification Centre reports <https://mbdiversificationcentres.ca/>

