Effectiveness of a Blend of Beneficial Microorganisms and Brassica Green Manures in Reducing Damage by *Phytophthora capsici* to Yellow Squash (*Curbita pepo*) Seedlings

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Introduction

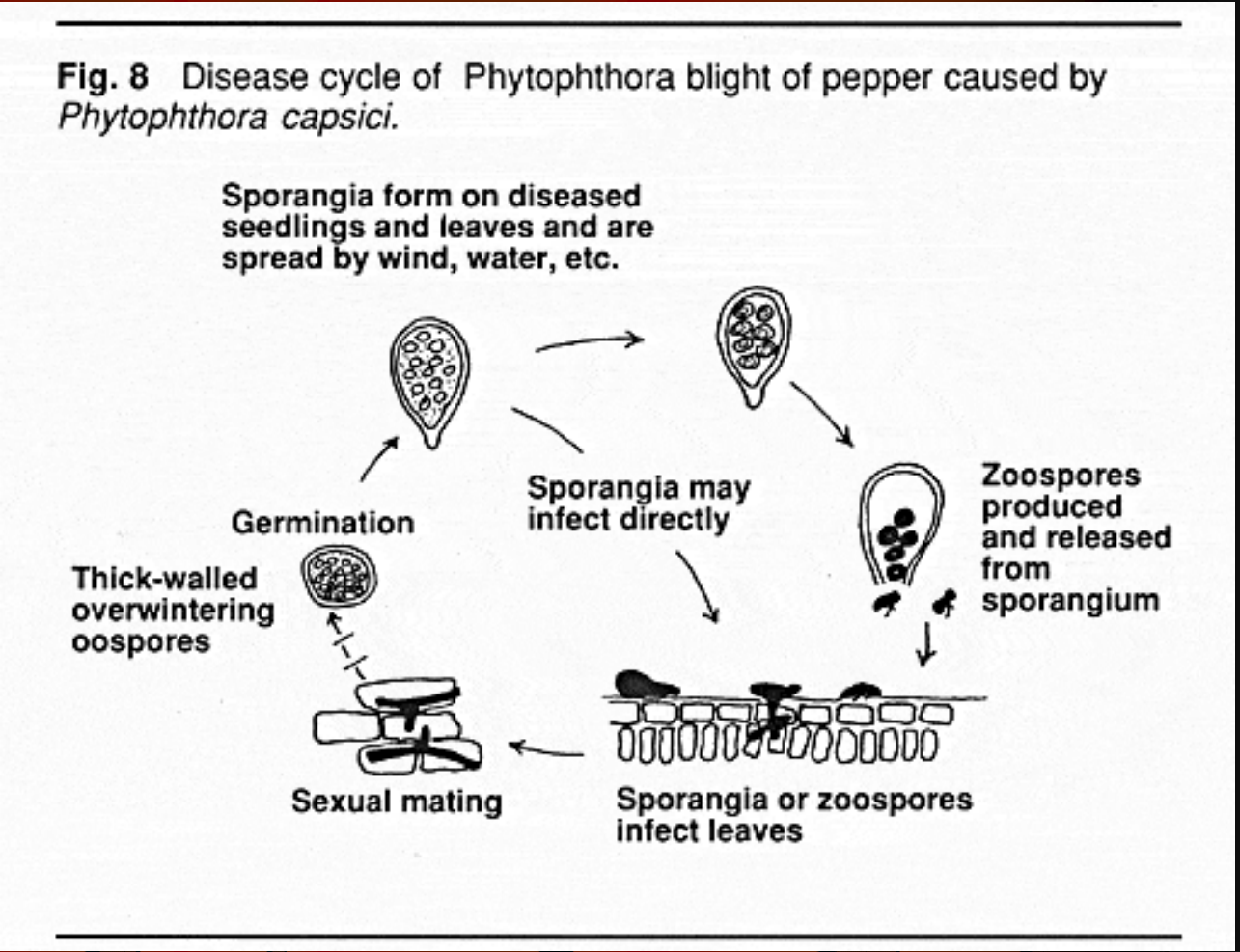
- *Phytophthora capsici*
  - soil-borne fungal pathogen of peppers, tomatoes, melons, cucumbers, and squash
  - causes severe losses

Blight is brown; vine tissue affected by *Phytophthora* appears water-soaked, and often collapses

- *Phytophthora capsici*
  - infected tissue becomes wilted, light green or grey-green and then scalded
  - first reported in California and Colorado in 1937

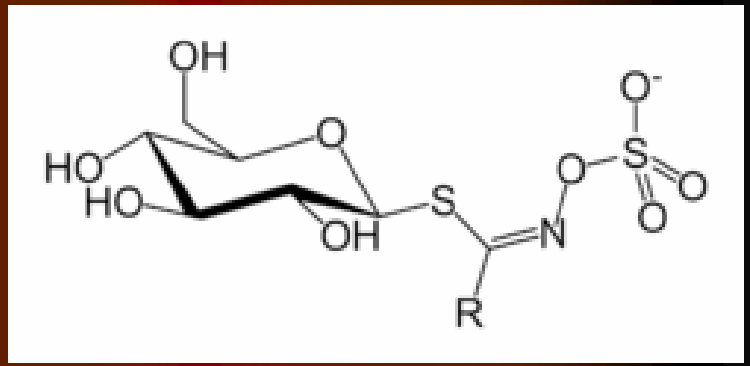
Disease Cycle

- Grows best between 25-30°C
- Forms microscopic spores called sporangia
- Forms thick-walled over-wintering oospores after mating



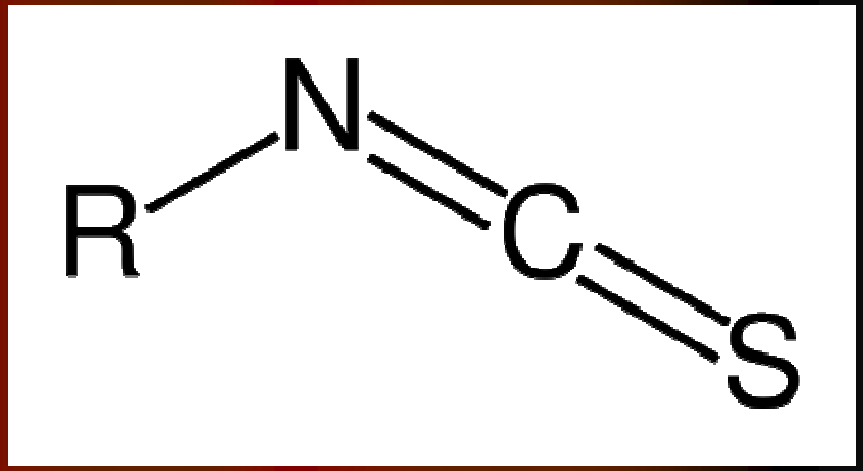
Biofumigation

- Use of volatile chemicals produced by plants to control or suppress soil-borne pests and diseases
- Brassicas (e.g. mustards, cabbages…) can produce between thirty to forty different glucosinolates
- Glucosinolates are organic compounds that are:
  - natural pesticides
  - part of the plant defense system
  - responsible for the bitter or sharp taste of many common foods such as mustard or radish
  - possible anti-carcinogens



Biofumigation

- Incorporation of brassica cover crops / green manures
- Glucosinolates break down into volatile isothiocyanates
  - Natural fumigant – antifungal properties



Organica Plant Growth Activator

- Intended to promote seedling and transplant establishment and viability
- 52 strains of beneficial soil microorganisms, amino acids, vitamins, biotin, folic acid and natural sugars
- Enhance nutrient availability, recycling and pathogen suppression

Objectives

- See if mustard greens incorporated into soil reduce disease-causing effects of *Phytophthora capsici*
- Compare effect of mustard greens -- which release glucosinolates -- to a common green manure without glucosinolates
- Test the ability of Organica to reduce pathogenicity of *P. capsici*
- Test any interactions between Organica and green manures.

Methods

- Split plot design:
  - Main effect – Presence/Absence of Organica
    - Blend of micro-organisms intended to promote seedling and plant establishment
  - Sub-plots – Presence/Absence of Glucosinolates
    - Presence: Biofumigation with Indian mustard greens high in glucosinolates (*Brassica juncea* c.v. "Pacific gold")
    - Absence: Incorporation of rye (*Secale cereale*)/vetch (*Vicia villosa*) cover crop to add organic matter but no glucosinolates

Methods

- 16 liters of organic planting mix was thoroughly mixed with 80ml of *Phytophthora capsici* inoculant (0.5% volume/volume) and divided into 12 equal portions

Methods

- Green manures were harvested at first flower, finely chopped and mixed into planting media at 0, 13.5, 27, 54, 108 or 216 g/l

Methods

- Mixture was randomly assigned to fill two of 24 evenly spaced 65 ml cells in each of the 10 seedling plug tray
- A pre-germinated yellow squash (*Cucurbita pepo*) seed was planted in each cell

Methods

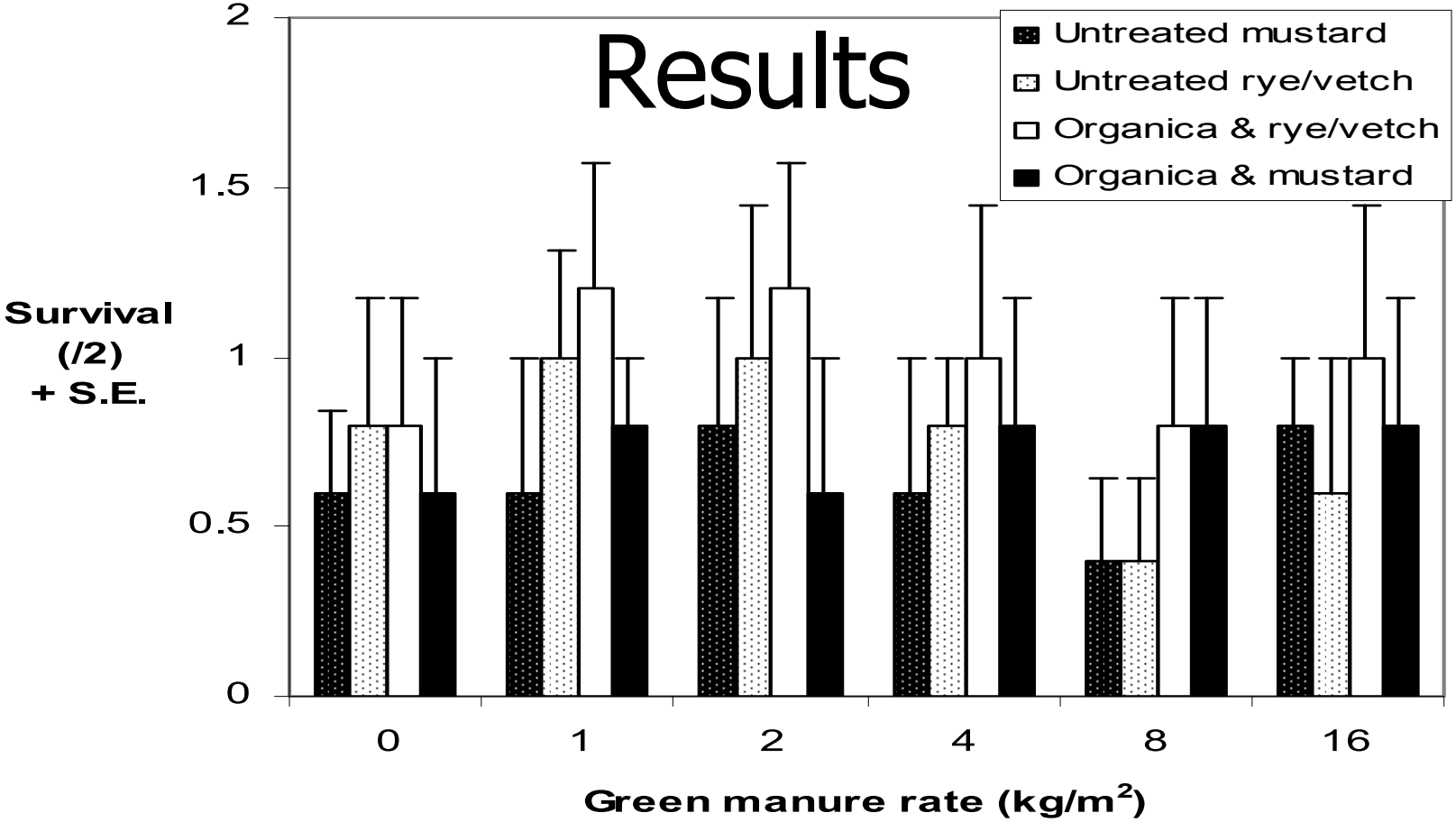
- Trays were randomly assigned to flood irrigation with untreated tap water or tap water treated with 4.2 g/l of (Organica Plant Growth Activator)

Methods

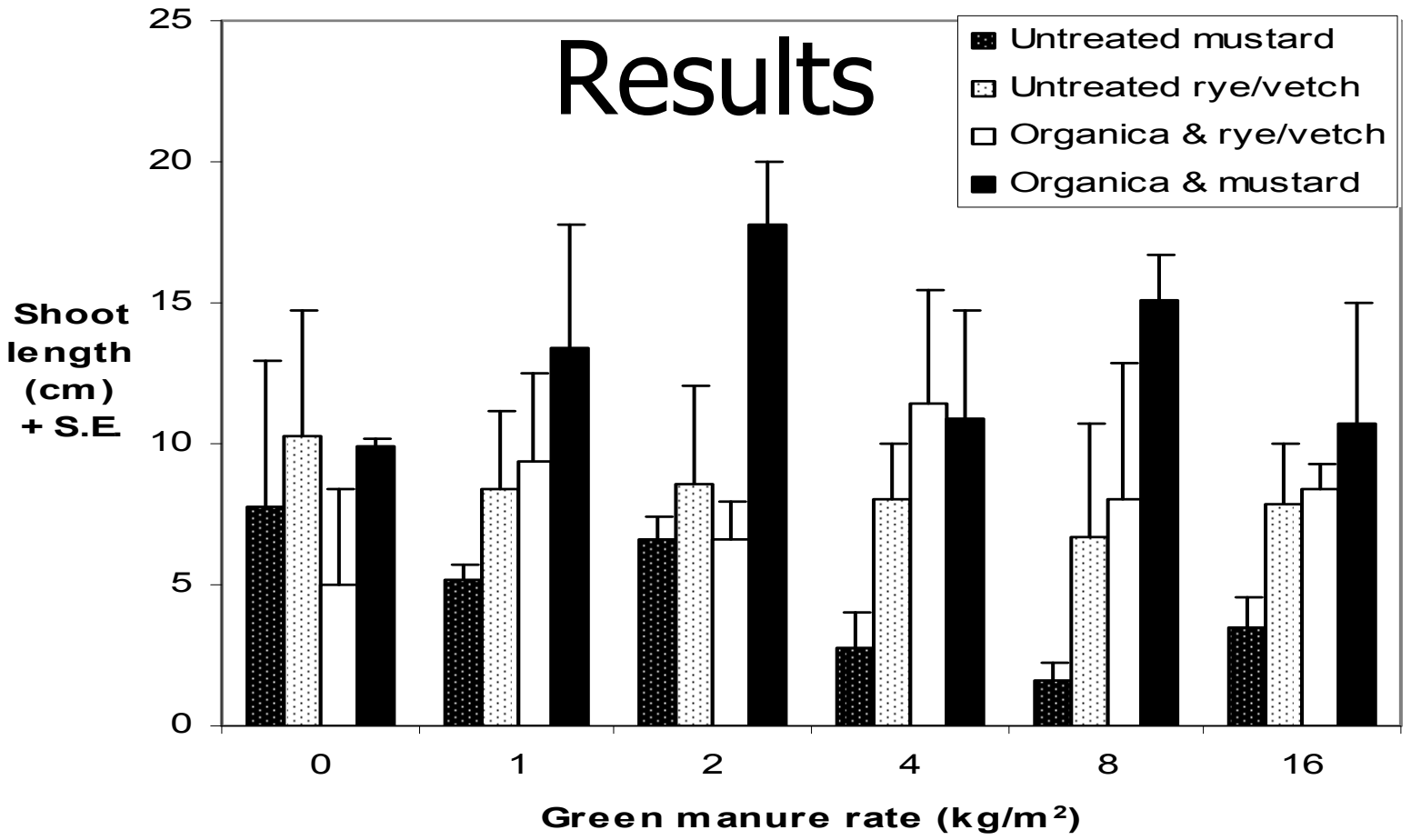
- Trays were partially submerged in the liquid to ensure through drenching and incubated for 5 days at 26°C .

Methods

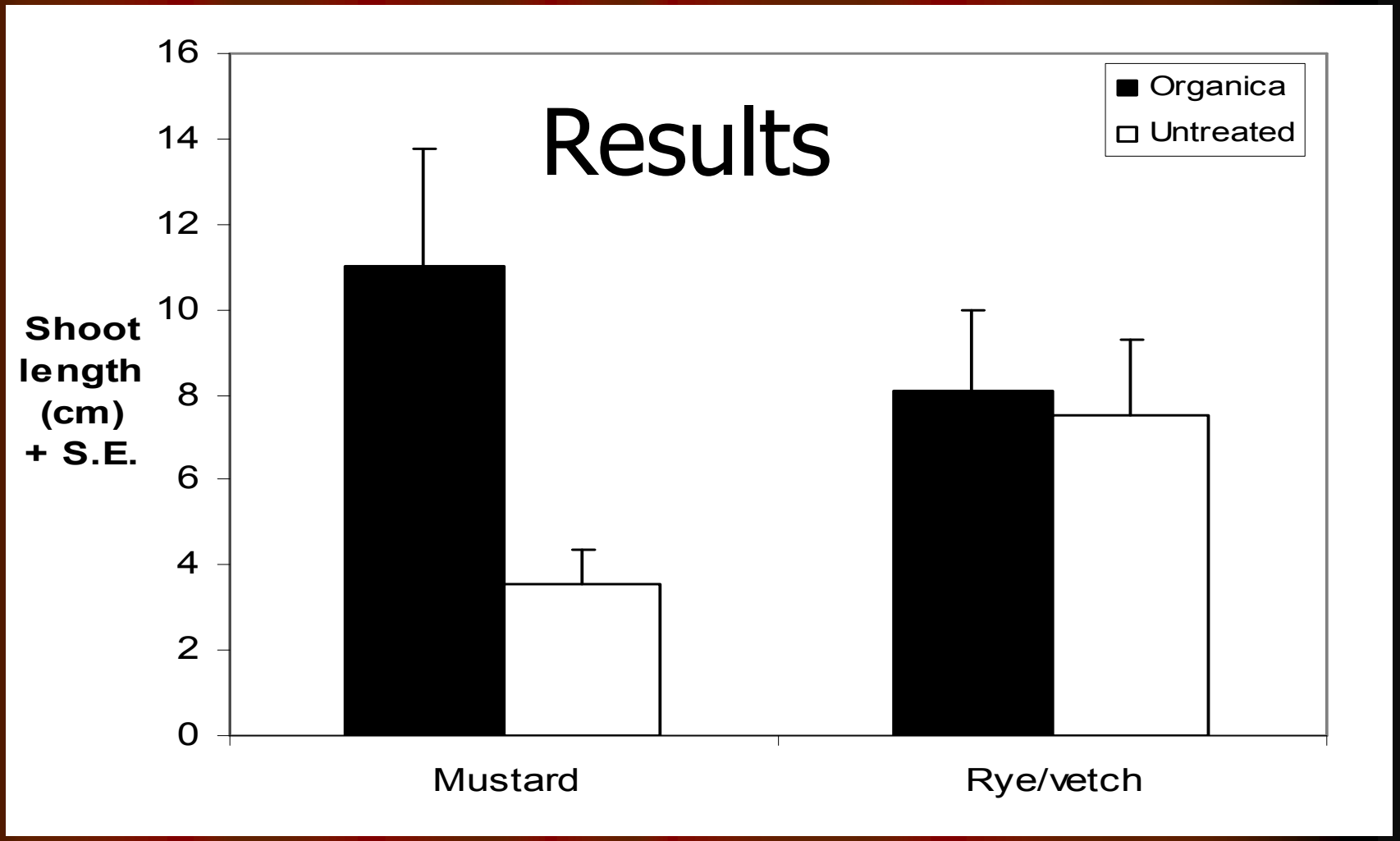
- Seedling survival and shoot length were recorded for each treatment combination in each of 5 replicates.



Survival of yellow squash after five days at 5 different green manure rates, with and without a commercial organic fertilizer (Organica PGA) containing beneficial microbials. Error bars show standard error of each mean (*n*=5). No differences were significant.



Shoot length (cm) of yellow squash after 5 days at a range of green manure rates, with and without a commercial organic fertilizer (Organica PGA) containing beneficial microbials. Error bars denote standard error of each mean (*n*=5).



Shoot length (cm) of yellow squash after 5 days with mustard or rye/vetch green manure additions, with and without a commercial organic fertilizer (Organica PGA) containing beneficial microbials. Error bars denote standard error of each mean (*n*=5).

Discussion

- Results were different than we expected. We expected the higher rates of mustard green manure applications to kill *P. capsici* allowing superior seedling survival and growth as reported for potato (Sexton 2007).
- We saw no response to application rate of mustard or rye/vetch green manures
- The only significant response was an increase in shoot length in the presence of Organica
  - Observed with mustard green manure but not with rye/vetch green manure
- This study should be repeated to determine whether the interaction between Organica and green manure treatments occurs consistently

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