CULTIVATING™ SUCCESS
small farms education

Today's webinar will start at 11am Pacific / 12pm Mountain

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sustainable small farms education

Wireworm Online Field Day

Diane Green, Greentree Naturals – Sandpoint, ID
Dr. Arash Rashed, University of Idaho Department of Entomology, Plant Pathology & Nematology
Atoosa Nikoukar, University of Idaho Department of Entomology, Plant Pathology & Nematology

March 16, 2021

The Cultivating Success™ Program was established by…

University of Idaho Extension

Rural roots
Healthy Food, Healthy Farms, Healthy Communities

Food Systems
Washington State University

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Today's Presenters

Diane Green
Certified Organic Farmer, Mentor, Educator
Greentree Naturals
www.greentreenaturals.com

Dr. Arash Rashed
Associate Professor
Department of Entomology, Plant Pathology and Nematology
Arashed@uidaho.edu

Atoosa Nikoukar
Ph.D. Student
Department of Entomology, Plant Pathology and Nematology
Anikoukar@uidaho.edu

Colette DePhelps, moderator
Area Educator, Community Food Systems
University of Idaho Extension, Northern District

FIELD DAY
Introduction to Greentree Naturals

Certified Organic Since 1992

We have 2.5 acres in production and grow 90 different varieties of vegetables, along with herbs, garlic, berries, and cut flowers. We make a living from what we grow and sell to our local community here in Sandpoint.

Our mission is to build community by offering educational opportunities utilizing organic and sustainable farming techniques, be a model of good land stewardship, and provide fresh, nutritious certified organic produce to our local community.

On-Farm Research

On-Farm Research Projects at Greentree Naturals

- **2017-2019 University of Idaho**
  - Soil Health & Fertility Testing to Optimize Organic Carrot and Beet Production in North Idaho
- **2014-2016 Washington State University**
  - Biodiversity and Natural Pest Suppression
- **2014-2016 University of Idaho**
  - Extension of Local Food Production in Idaho Using High Tunnel Technology
- **2009-2011 Washington State University**
  - Combining Trap Cropping with Companion Planting to Maximize control of the Crucifer Flea Beetle

On-Farm Field Days

- Field days on the farm provide an excellent opportunity for hands-on demonstrations where university educators and graduate students can highlight research results and share specific management practices with our local community.

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Field Day at Greentree Naturals

How we created the perfect storm for wire worms to flourish

First signs of a pest problem following no-till

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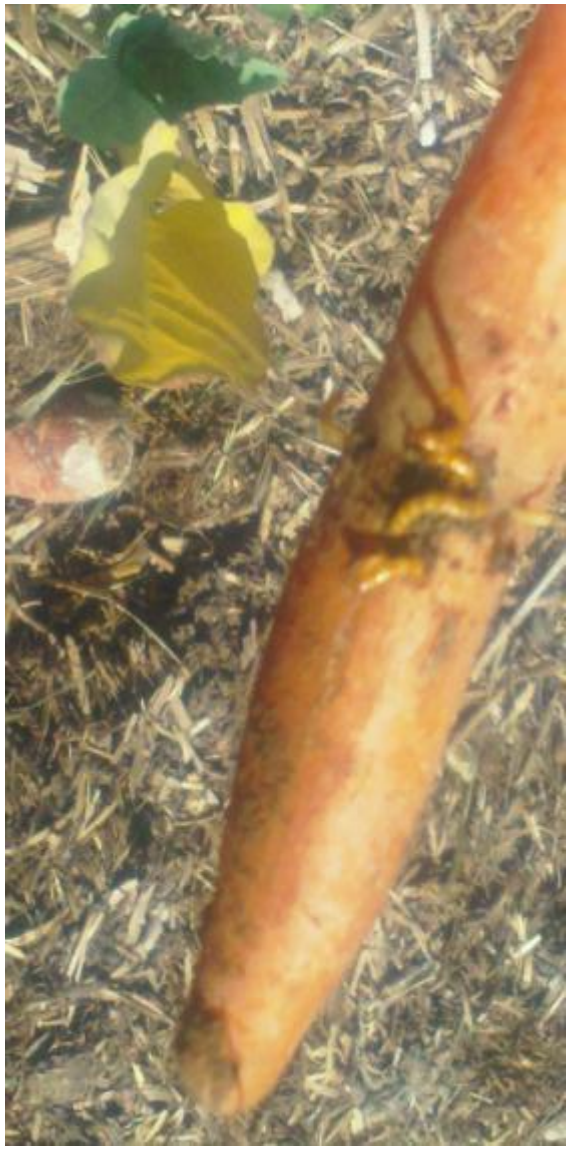

Using carrots as a trap crop for the wire worms….

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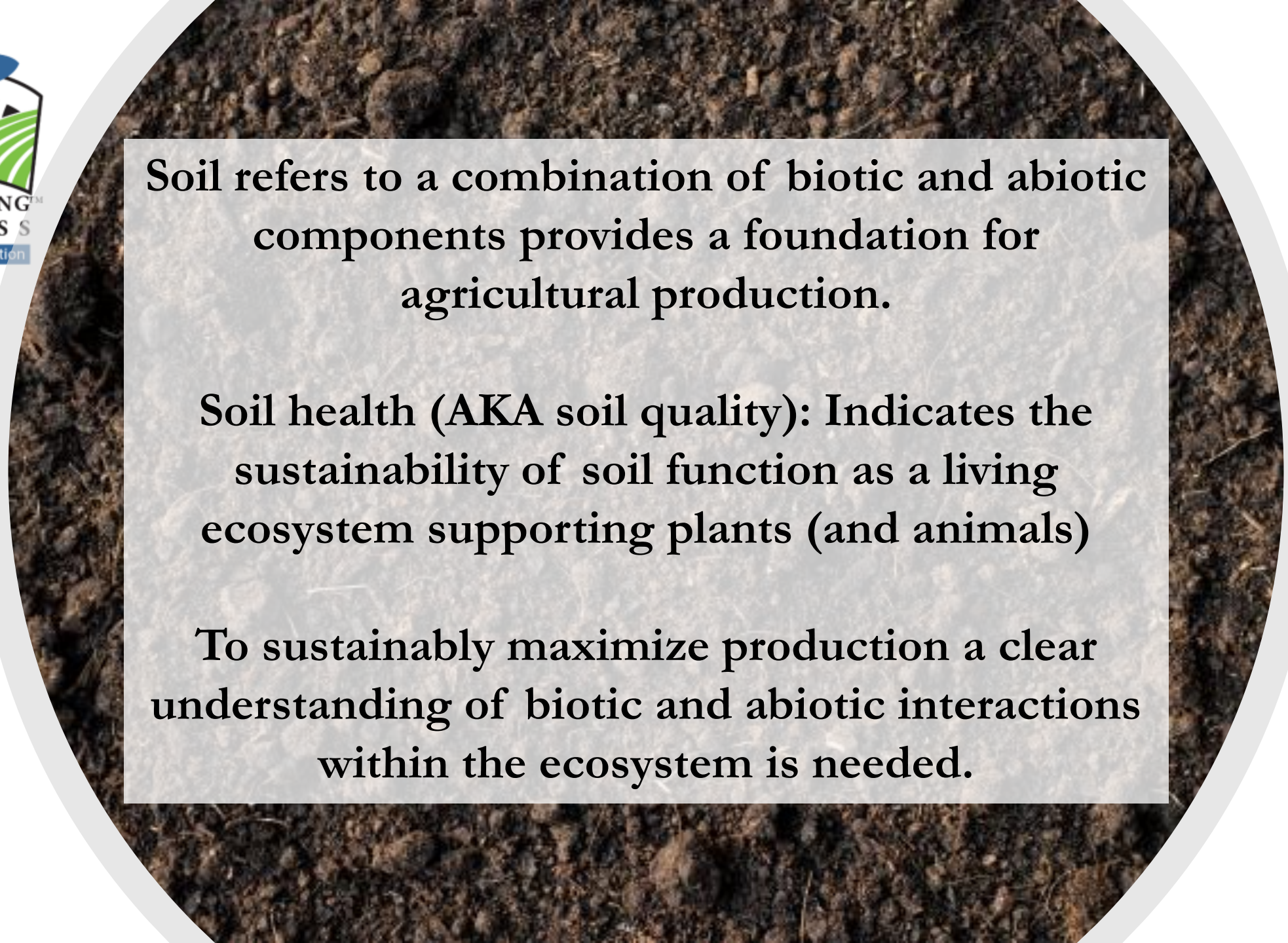
We are grateful to have had this opportunity to work with Atoosa Nikoukar and Dr. Arash Rashed on this Project Title: Efficacy Evaluation of Biological Control Agents Against Wireworms in Organic Production



Soil refers to a combination of biotic and abiotic components provides a foundation for agricultural production.

Soil health (AKA soil quality): Indicates the sustainability of soil function as a living ecosystem supporting plants (and animals)

To sustainably maximize production a clear understanding of biotic and abiotic interactions within the ecosystem is needed.

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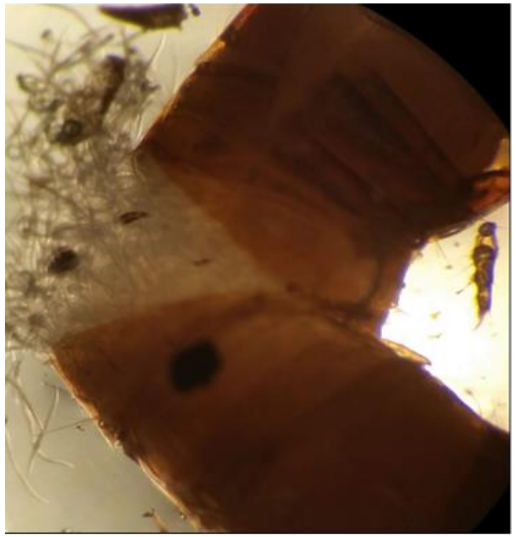
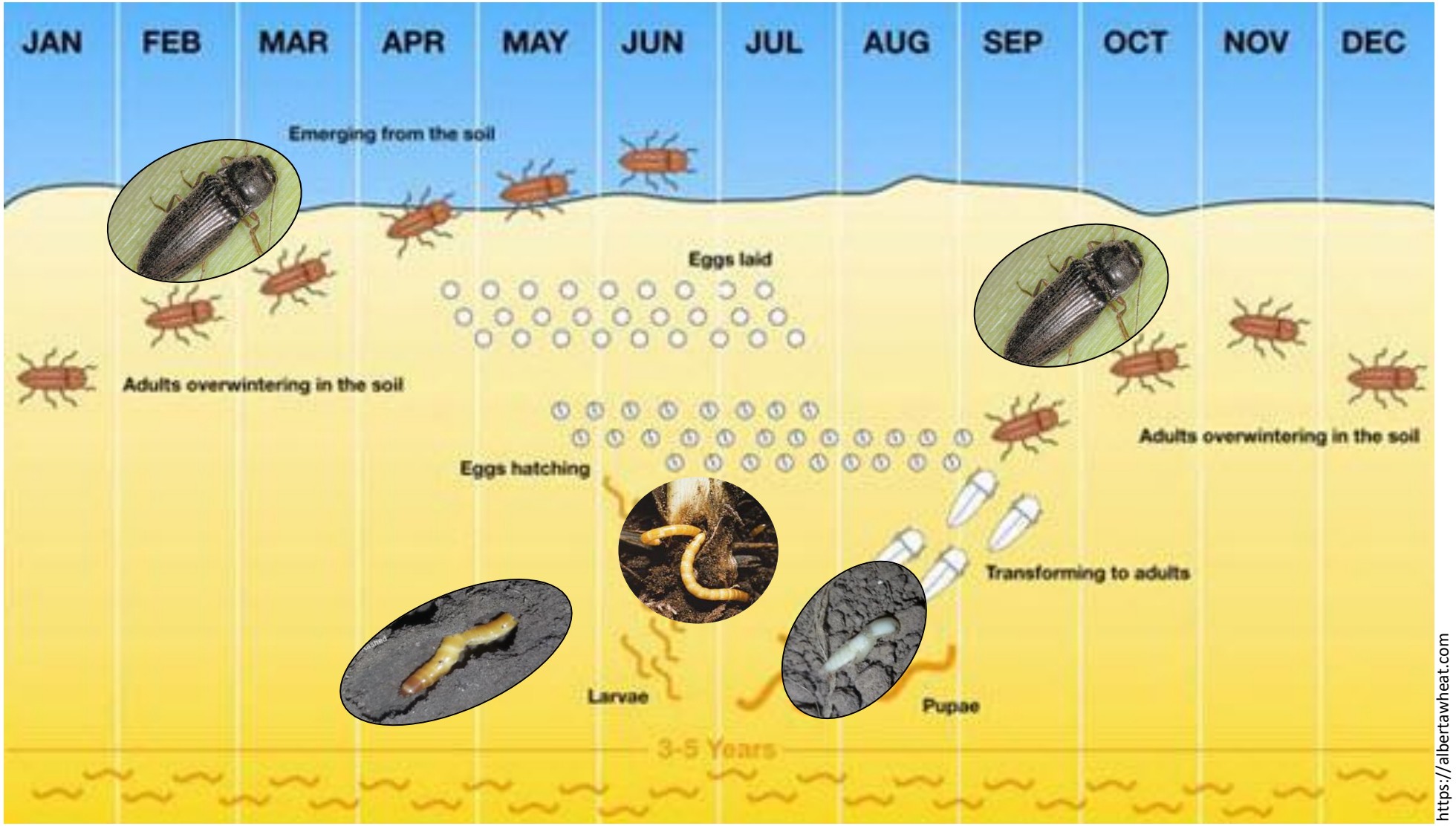


Larva
3-5 years
Feeds on any crop

Pupa
1-2 weeks
No feeding

Click beetle
Months
Not damaging

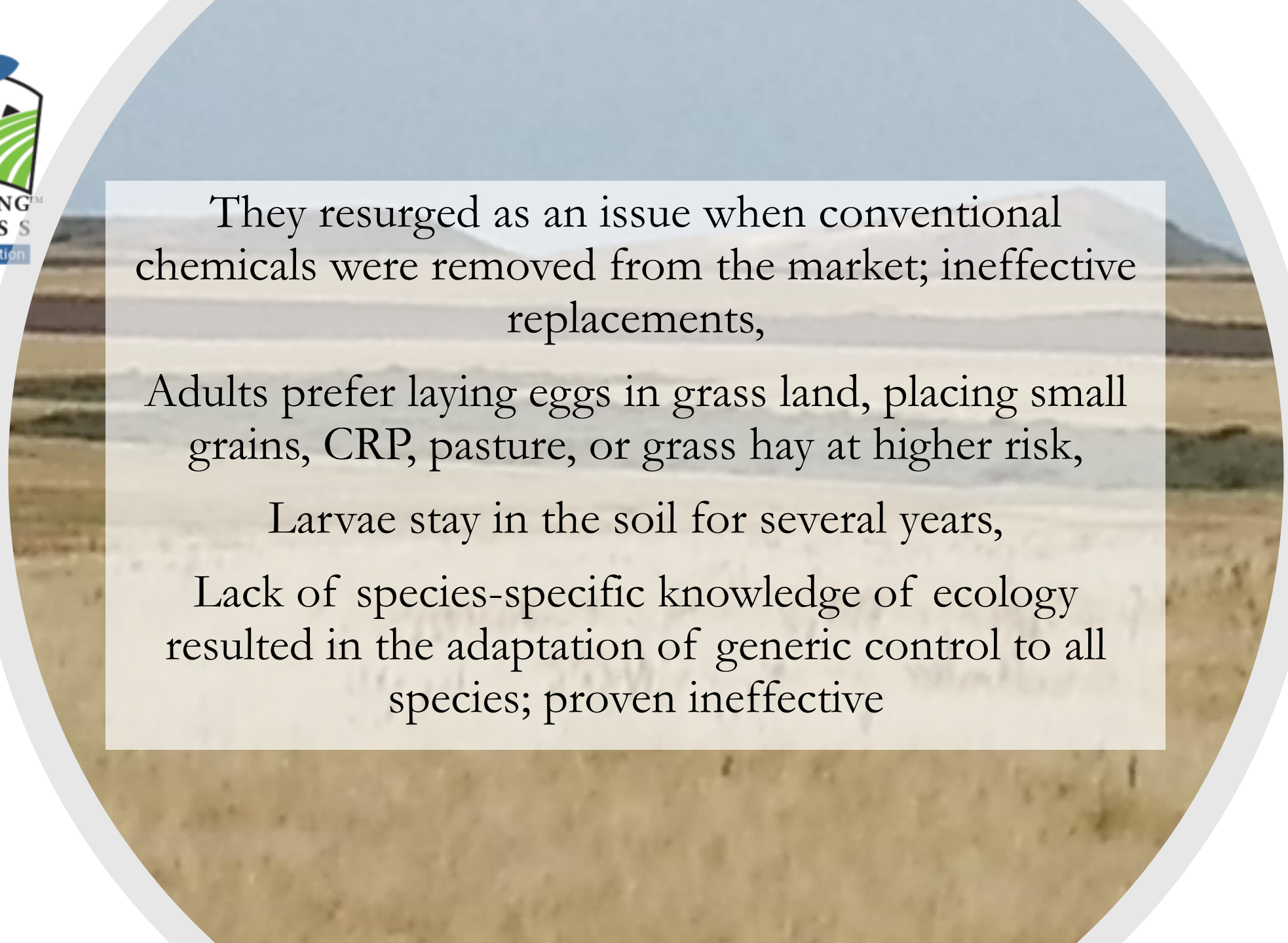
➢ Life cycle of wireworms



https://albertawheat.com

➢ Wireworms as crop pests:

- Feeding on a wide range of crops including cereals, potato , carrot and sugar beet.



They resurged as an issue when conventional chemicals were removed from the market; ineffective replacements,

Adults prefer laying eggs in grass land, placing small grains, CRP, pasture, or grass hay at higher risk,

Larvae stay in the soil for several years,

Lack of species-specific knowledge of ecology resulted in the adaptation of generic control to all species; proven ineffective

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Using a solar bait trap to monito wirew

1. Soak 1 cup of untreated seed mixture of wheat, barley, and corn (or wheat and barley) for 48 hours. For irrigated fields this step is not necessary.

2. Prepare the following items: shovel, 2 x 2 foot squares of dark plastic, and flags to mark trap locations. Optional: sections of pantyhose (see step 3).

3. Dig a 6-inch deep hole in the soil and place the seed from step 1 into the hole. Optional: seed could be placed in a section of pantyhose for easier collection.

4. Bury seeds in loose soil, forming a mound about 3–4 inches above the soil surface.

5. Pla he dark, 2 x cover outer edge. keep it n being blo mark the t location.

6. In about 2 weeks, remove th lastic a recover the germinating clun of seed surrounding soil.

7. Place it in a bag marked wit rap loca

8. Look through the material ith suffi wireworms, and use the v ual identi pages 5 and 6 to identify hem to s

Ongoing Idaho wireworm survey/monitoring

Knowing the species of wireworm makes a difference, because species differ in activity time

Limonius infuscatus

http://www.cals.uidaho.edu/edcomm/pdf/BUL/BUL0898.pdf

Current management recommendation

Field preparation

- Provide a base for healthy and vigorous stand emergence; e.g., packing soil expedites emergence and limit wireworm movement

Tolerance

- Barley and oats are more tolerant of wireworm damage then wheat

Rotation

- Multiple years of alfalfa- Helps with soil packing (albeit, species dependent)
- Rotation with *Brassica* sp.

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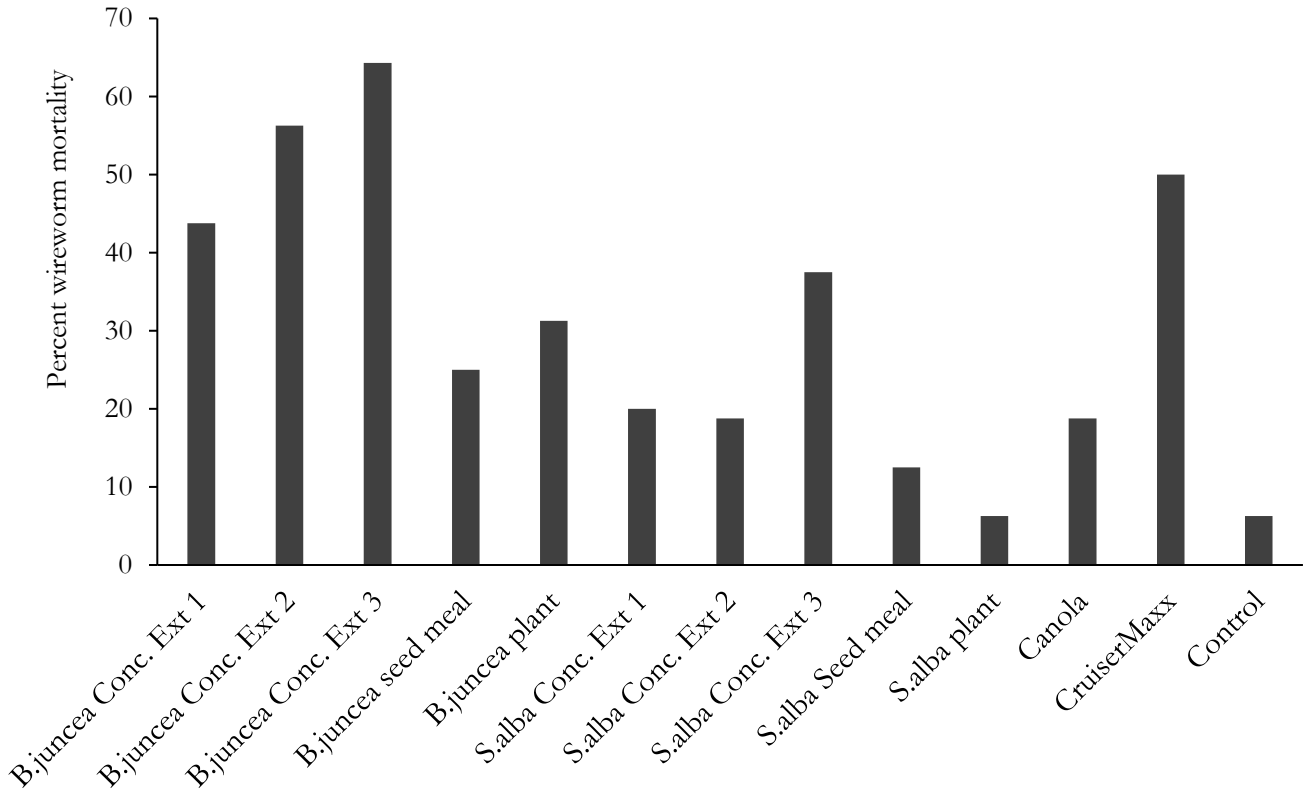
Mustard species and their products in wireworm management (ongoing)

Remember: *Choose the right species of mustard!*
Mustard species makes a difference



Brown mustard appears to be more effective than yellow mustard against wireworms

Seed meal and concentrated extracts are effective

But what are effects on the soil microorganisms?

Subject of current studies.

Biological Control?

- Entomopathogenic Nematodes
- Entomopathogenic fungi

Commercially available entomopathogenic nematodes and fungi

Metarhizium anisopliae

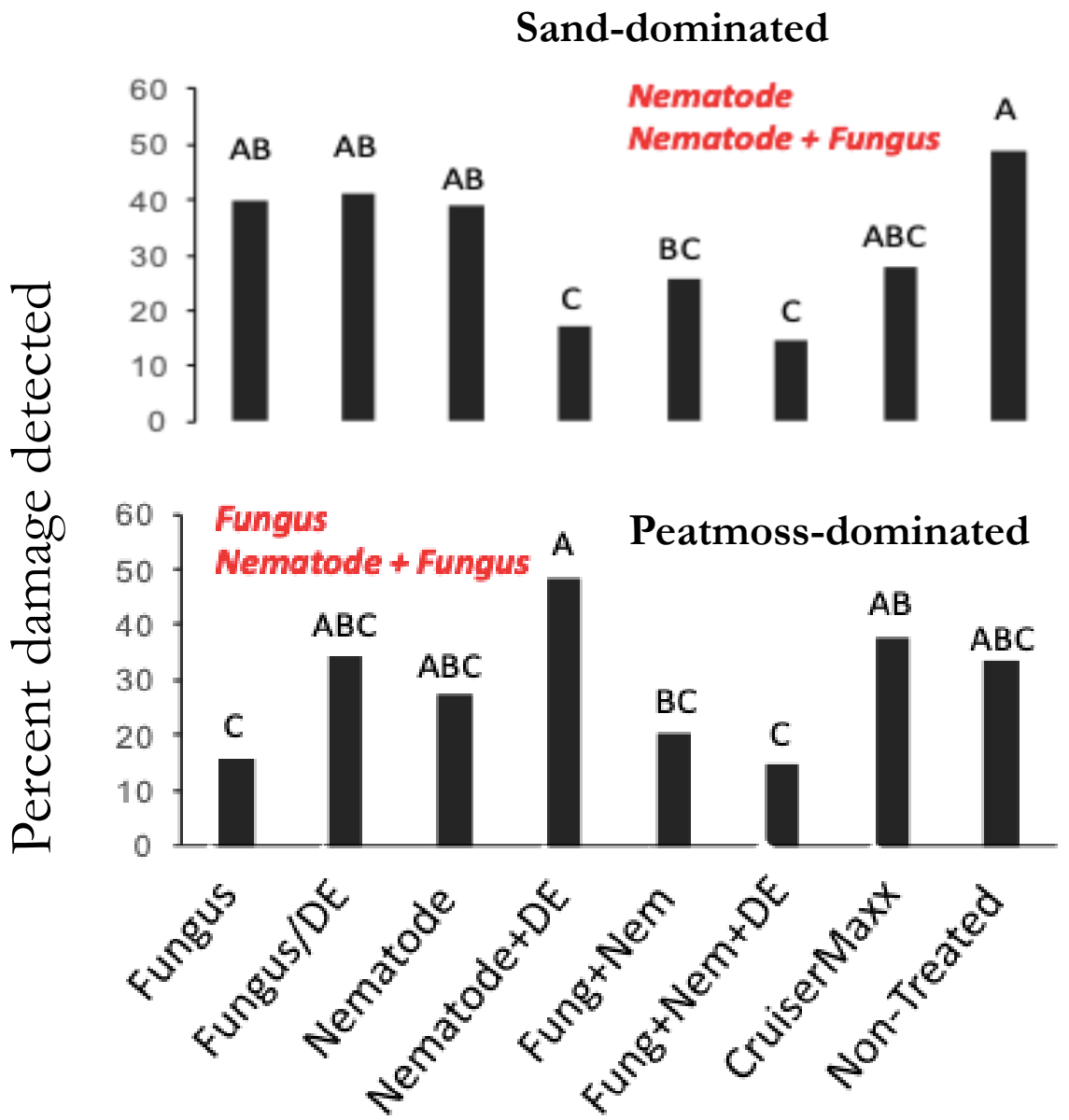
Nematode

Steinernema carpocapsae

Diatomaceous earth

- **Sand-dominated** (70% sand+25% peatmoss)
- **Peatmoss-dominated** (50%sand + 50% peatmoss)

Biological control against wireworms



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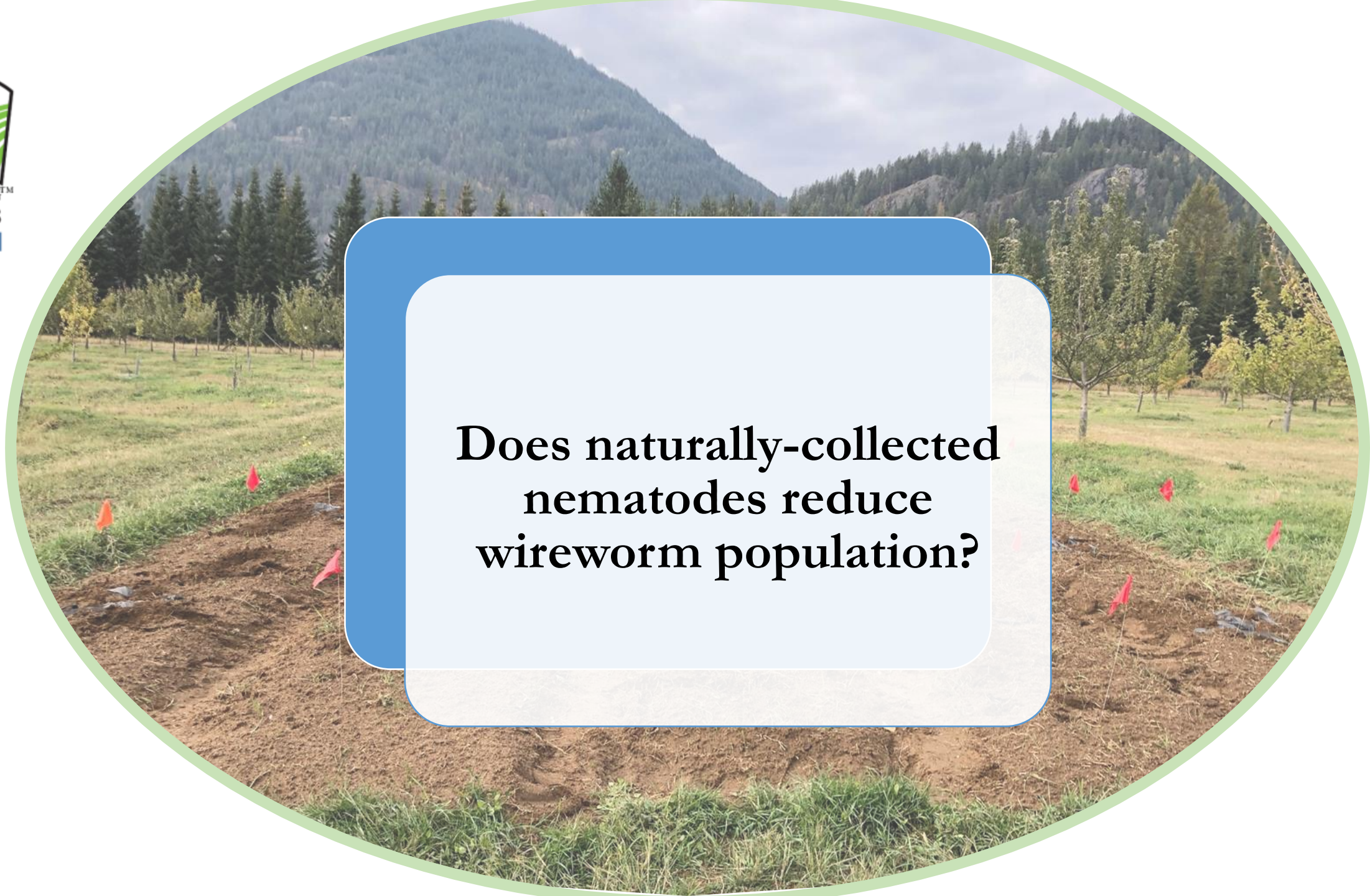
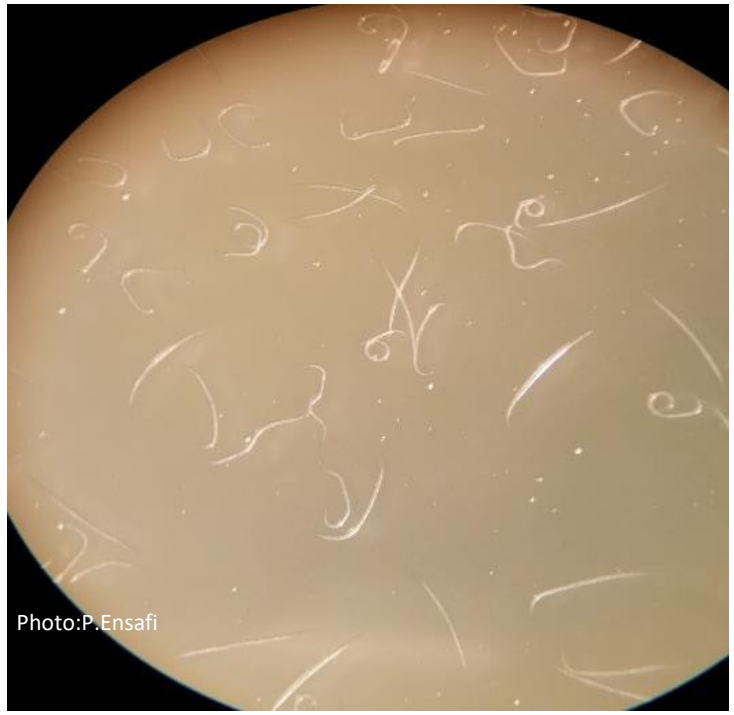


Does naturally-collected nematodes reduce wireworm population?

➢ Locally-collected nematodes Vs. commercially available nematodes against wireworms

- Entomopathogenic nematode (EPN) collection:

Field collected EPNs recovered from soil, using white trap, *Galleria mellonella* (Lepidoptera: Pyralidae)

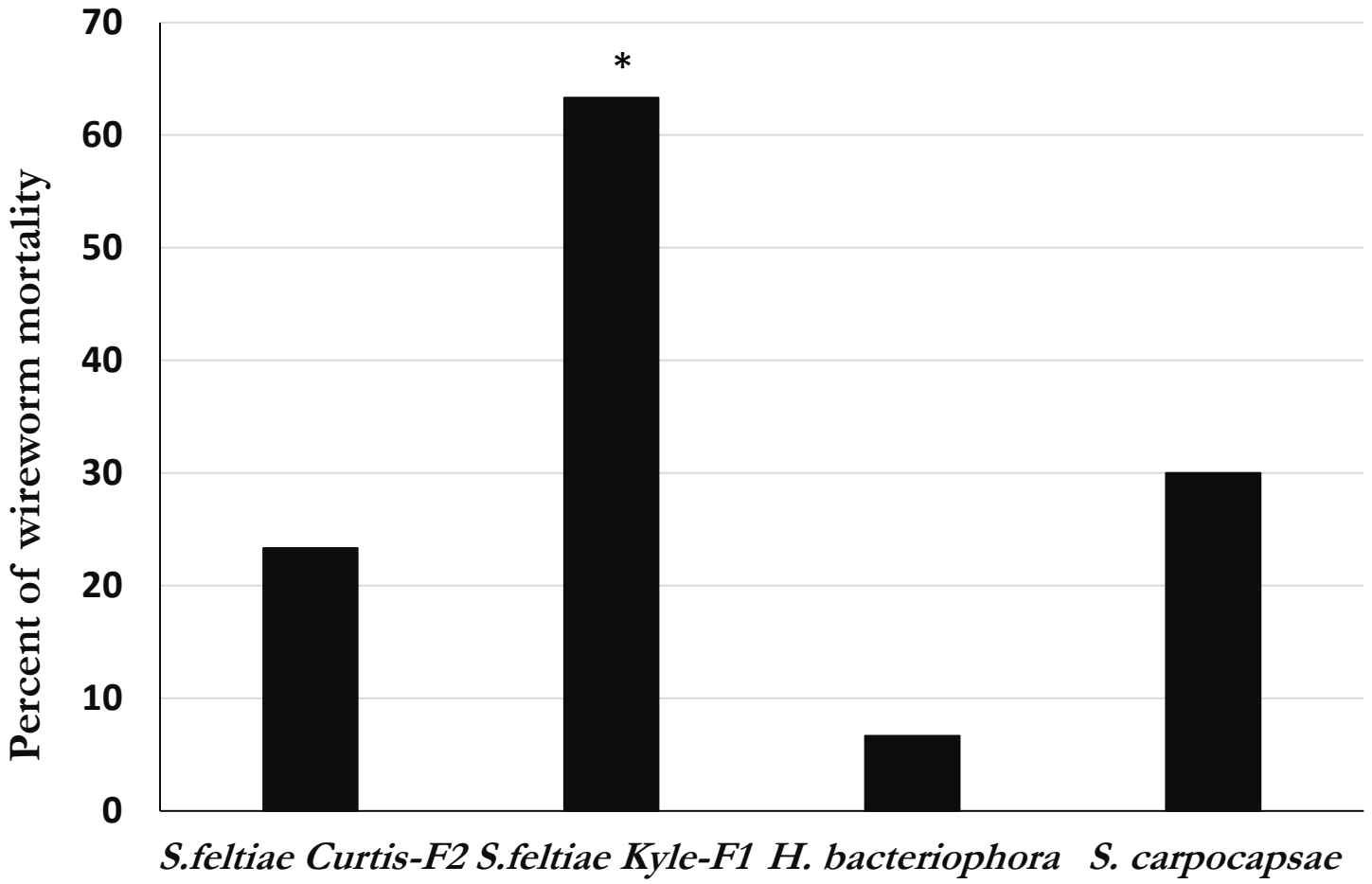


Wireworm collection:

Sugar beet wireworms were collected from dryland wheat fields in Ririe, ID, using solar bait trap.

Photos by: A. Rashed and F. Aguilar

- The field-collected nematode, *S. feltiae* Kyle-F1, caused significantly higher mortality in wireworms compared to other species/isolates



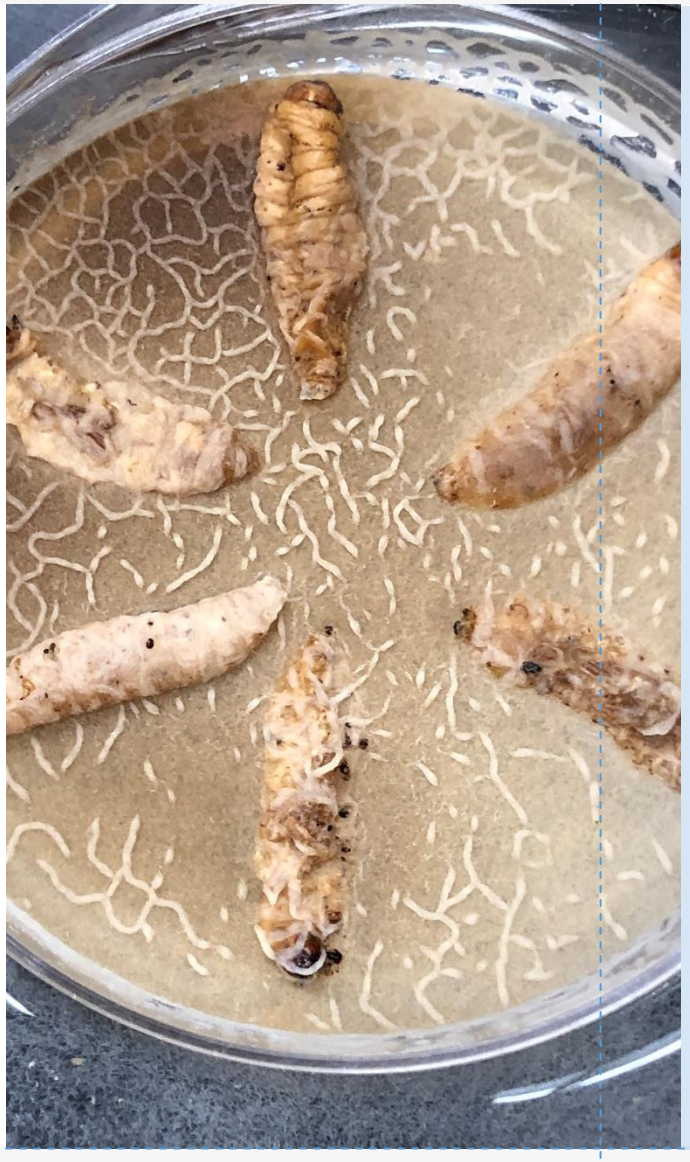
Generalized Linear Mixed Model (GLIMMIX): $F_{3,116}=6.39$; $P< 0.001$)

➢ Biological control against wireworm in organic farming

- **Study sites:**
  - Greentree Natural Certified Organic Farm(Sandpoint)
  - Sandpoint Organic Agriculture Center (SOAC)
  - Pokey Creek Certified Organic Farm (St. Marries)

- **<u>Field –collected nematodes:</u>**

- Soil samples from each study site were collected.
- Local nematodes recovered from soil samples using Galleria bait trap, *Galleria mellonella* (Lepidoptera: Pyralidae)



Nematode

Steinernema feltiae

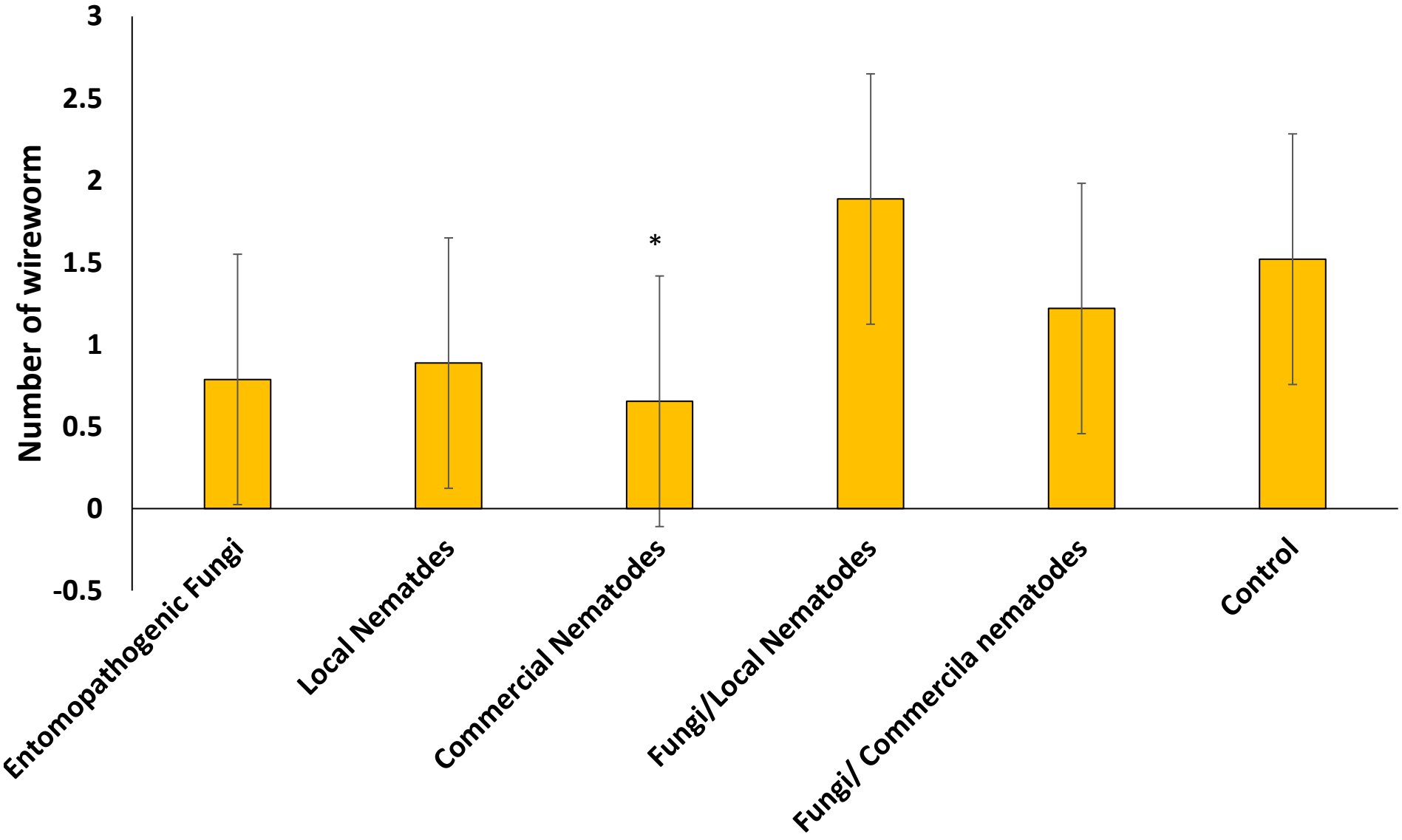
Fungus

Beauveria bassiana

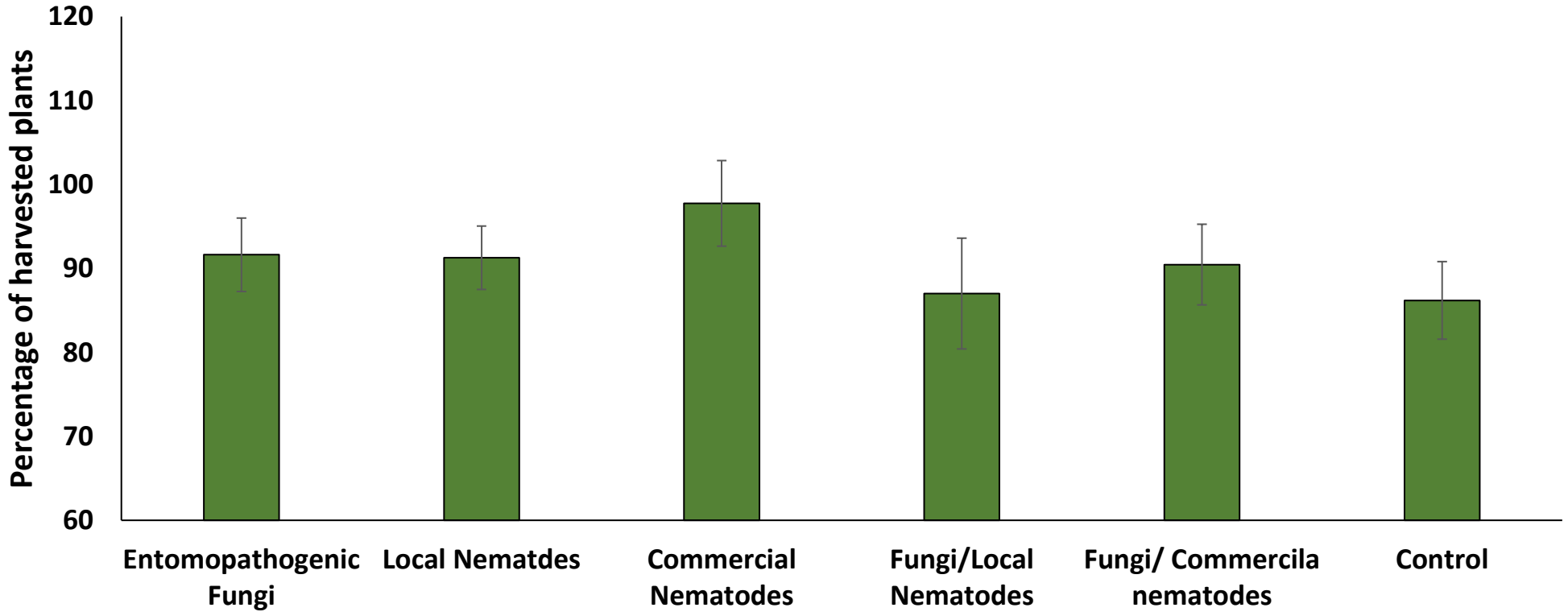
1. Entomopathogenic fungi (*Beauveria bassiana*)
2. Commercial entomopathogenic nematode (*Steinernema feltiae*)
3. Locally collected entomopathogenic nematodes
4. Fungi/ commercial nematode
5. Fungi/ local nematode
6. Non-treated control

- **<u>Data Collection:</u>**
  - *<u>Wireworm counts</u>*: sampled wireworms two times; before planting and after harvest using solar bait trap

- **Wireworm counts:**

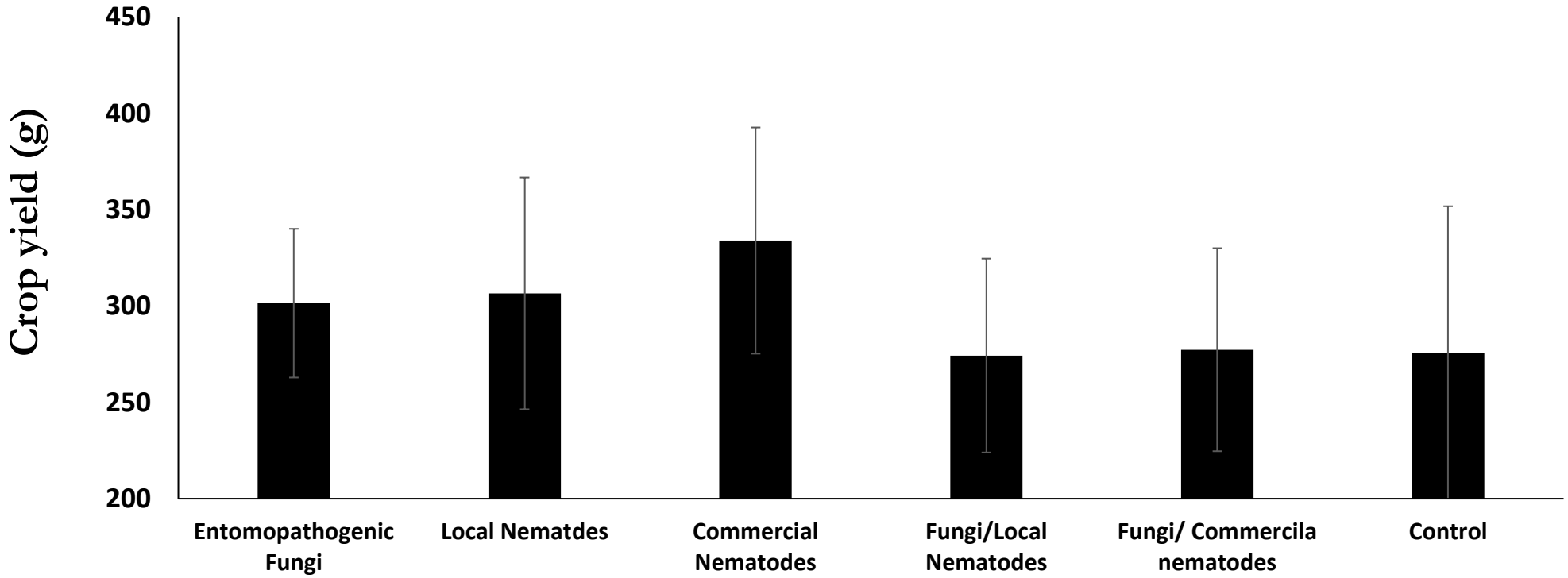


- *Stand count*: number og plants in each plot were counted two times; after germination and after harvest



Crop yield: bean pods were collected, dried in greenhouse and measured

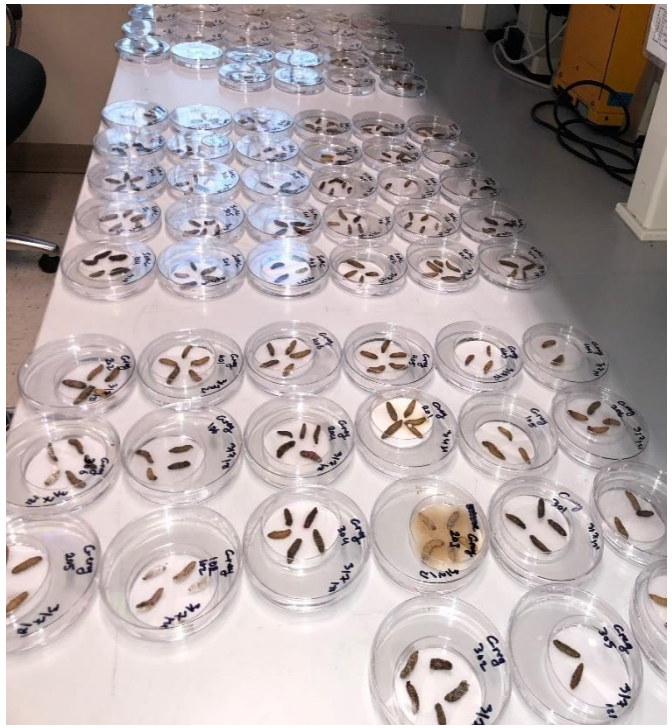
- **Crop yield:**


Crop yield (g)
450
400
350
300
250
200
Entomopathogenic Fungi
Local Nematdes
Commercial Nematodes
Fungi/Local Nematodes
Fungi/ Commercila nematodes
Control

***Biological control agents persistence*:**

- Do applied biological agents remain active in the soil after harvest?

- will they remain effective in the following season?



➢ Next Steps…

- ❑ Complementary greenhouse study:

- ❑ Evaluating biological control agents persistence in next growing season

Questions?