Effect of free living nematodes and their associated microbial community on conservation biological control

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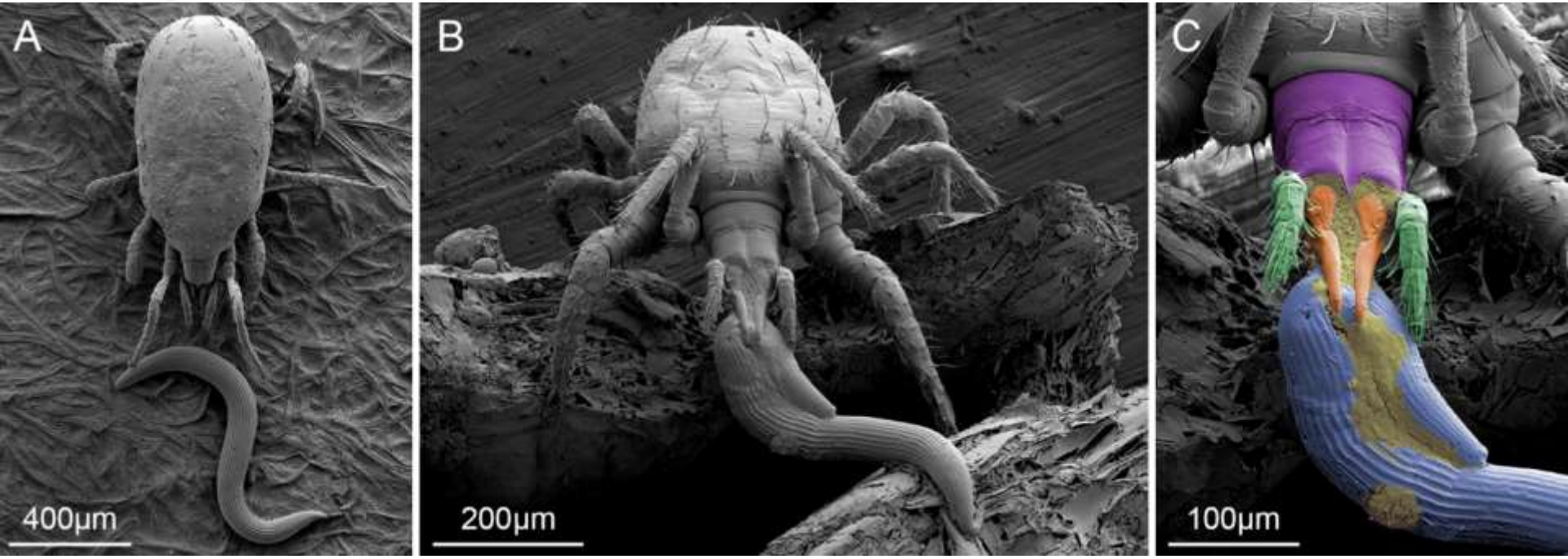
Beltsville team – Microscopy, Nematology and Acarology units

Presentation objectives

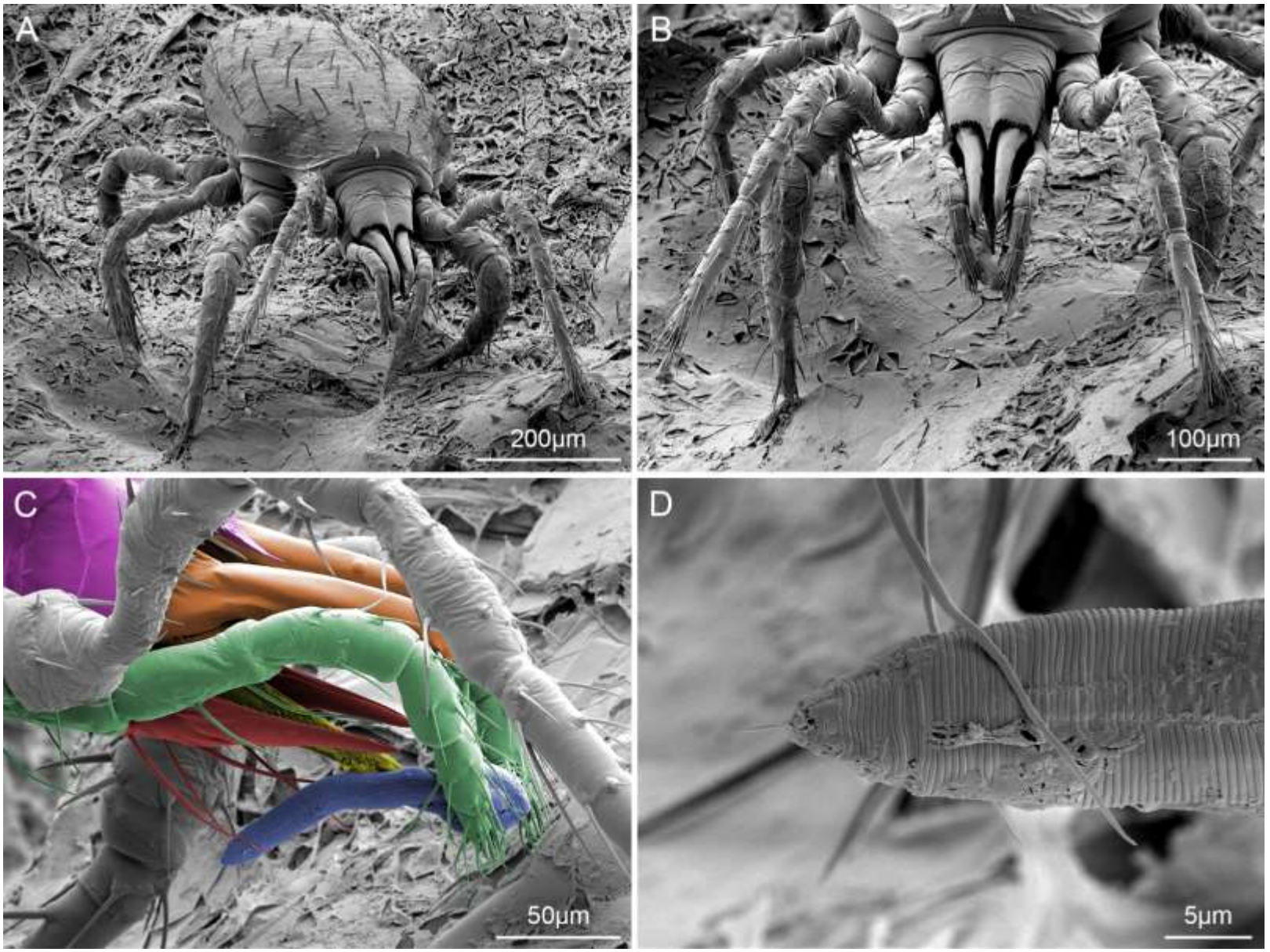
1. Convince you, with stunning images taken with a low temperature scanning electron microscope (LTSEM) that soil predatory mites feed on:
   - Beneficial Free living nematodes (FLN).
   - Plant parasitic root knot nematodes (RKN).
2. Demonstrate how FLNs and their associated microbial community (MC) can enhance conservation biological control of insects and RKN.
   - House fly control by *Macrocheles embersoni*.
   - Root knot nematode control by *Stratiolaelaps scimitus*.

Stratiolaelaps scimitus predation of the FLN *Pristionchus aerivorus*-LT-SEM



Azevedo et al. 2020. Biological Control

Stratiolaelaps scimitus predation of RKN - LTSEM



The effect of provisioning the FLN *Rhabditella axei* on biological control efficacy of the house fly by the predatory mite *Macrocheles embersoni*

Predatory mite
M. embersoni

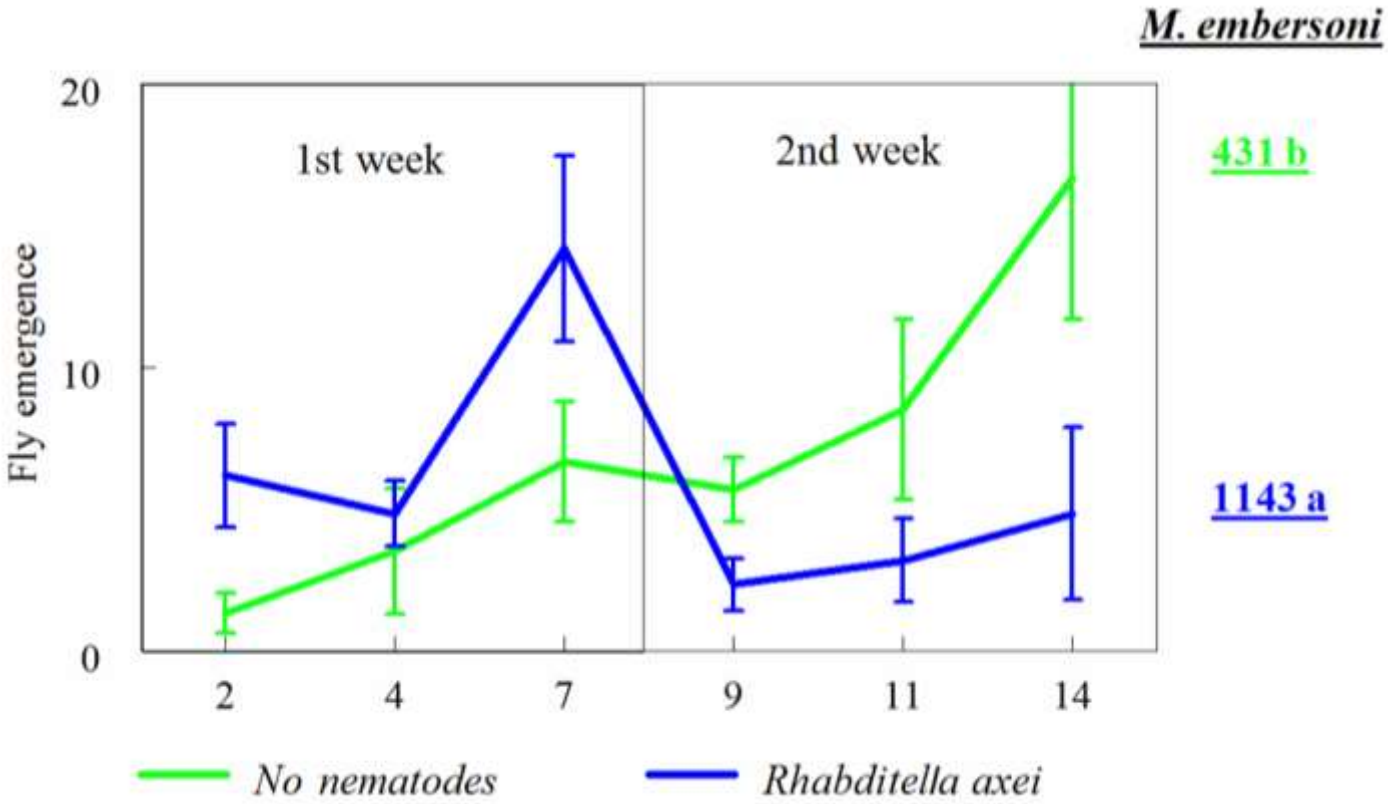
House fly eggs + *R. axei*

House fly eggs

Azevedo et al. 2019, Biological Control

The FLN *R. axei* in its culture media (CM)

Effect of provisioning FLN in its CM on fly emergence and predatory mite abundance



FLNCM (2)*Predator (2)*RKN (2)
8 treatments per block, replicated 12 times
Experiment 1 & 2, duration 5 and 15 weeks

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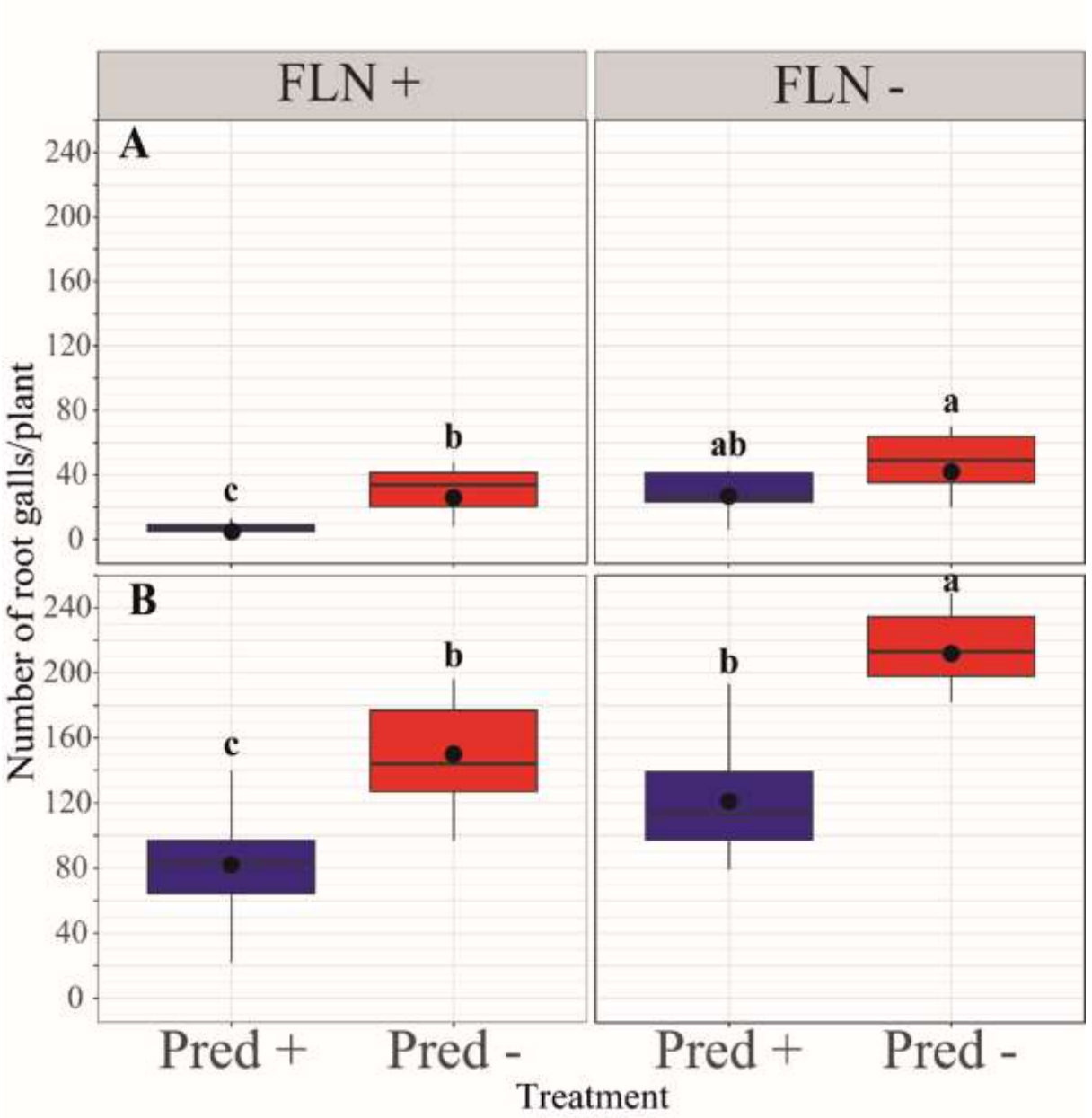
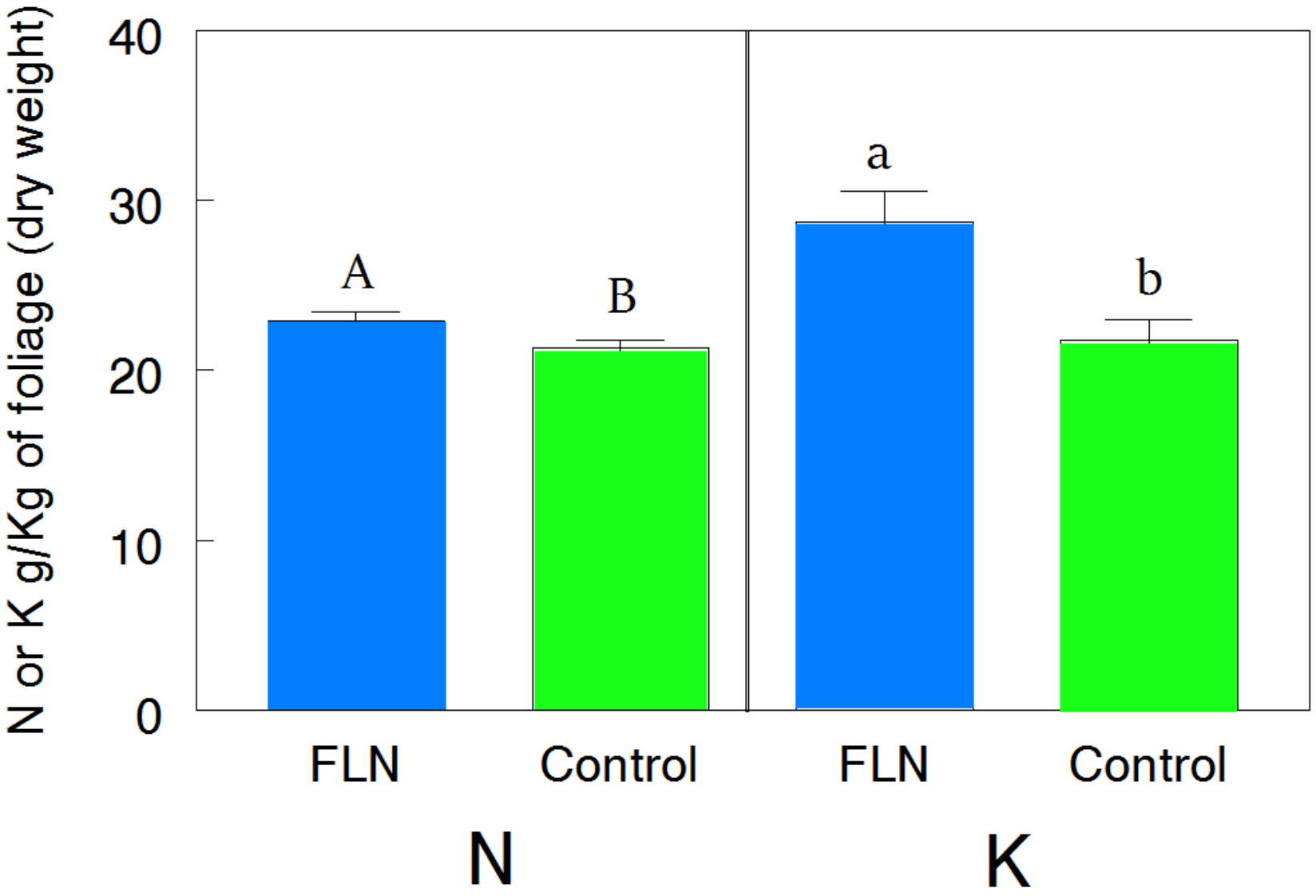
Effects of FLNCM+Predators on number of galls 5 and 15 weeks post inoculation, Exp.1&2 (A&B)



Effect of FLN it is culture medium on plant health
Foliar nutrient uptake of N and K



Take home messages and Open questions

- Diet diversity is essential for the sustainability and efficacy of biocontrol agents, and FLNs are key components of the soil predatory mite diet.
- In soils, the correct balance of organic matter, water and aeration are needed so that terrestrial mites and semi-aquatic FLN can survive, interact and thrive.
- Can FLNs with their associated microbes be manipulated to improve biocontrol and plant fitness?
- How can organic amendments be utilized to enhance the conservation of the soil food web?

Microbes->FLN->Predatory mites.

Latin American undergraduates, graduates, postdocs and faculty participating in this study















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Thanks for your attention

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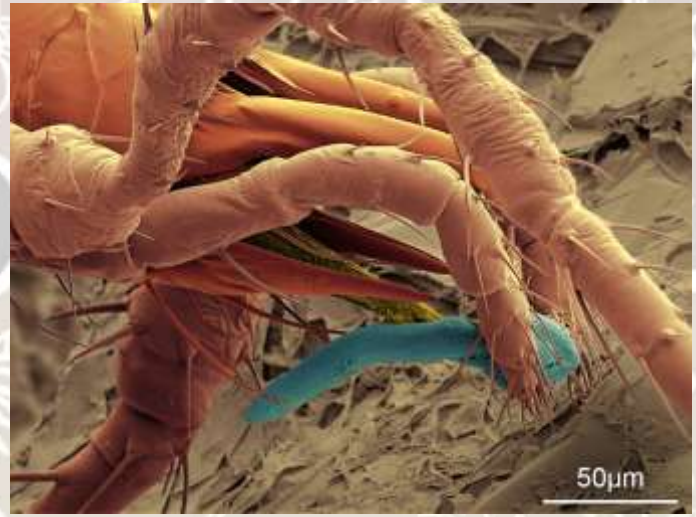
First prize winner FAO Soil biodiversity contest 2020
https://www.flickr.com/photos/faooftheun/albums/72157716380971407/



The FLN *R. axei* in its culture media (CM)

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Can nematode diet affect predator fecundity?

M. embersoni

Rhabditella axei reared on the diverse bean soup diet

Rhabditella axei Reared on yeast on Nutrient Agar

Effect of nematode dose, reared on a diverse vs. uniform diet, on *M. embersoni* fecundity