



# Innovation in Nematode Management: Development of a Biological Product with *Aspergillus niger* (CECT-21308)

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# Innovation in Nematode Management: WHY?

## Phytopathogenic nematodes

### Biological control offers:

- ✓ Efficient and environmentally friendly solution,
- ✓ Uses natural organisms, to reduce harmful nematode populations

To cause losses of up to 12% of global crop production each year, equivalent to billions of dollars in **economic losses**.



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### Plant Pathogenic Nematodes

Plant pathogenic nematodes are those that directly affect plants, causing damage to their roots or underground structures.

### Main Subgroups:

- Endoparasitic Nematodes (Live inside plants)
- Ectoparasitic Nematodes (Live on the surface of plants)
- Bacteriophage Nematodes (Feed on bacteria, but interact with plants)



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### Plant Pathogenic Nematodes

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**Non-Phytopathogenic Nematodes** Non-phytopathogenic nematodes do not cause direct damage to plants, although they play an important role in the soil ecosystem by contributing to the decomposition and recycling of nutrients.

### Main Subgroups:

- Free-Living Nematodes
- Predatory Nematodes
- Saprophytic Nematodes



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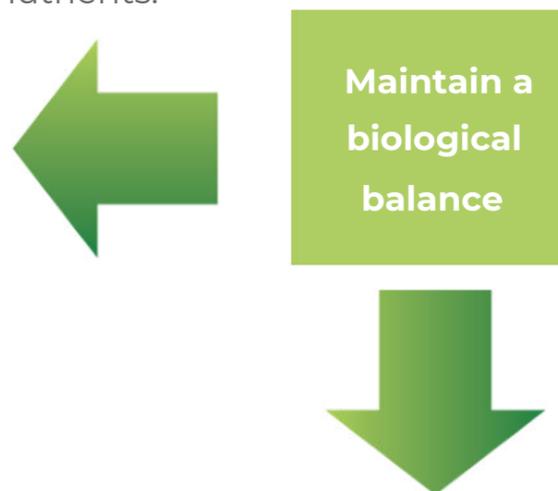
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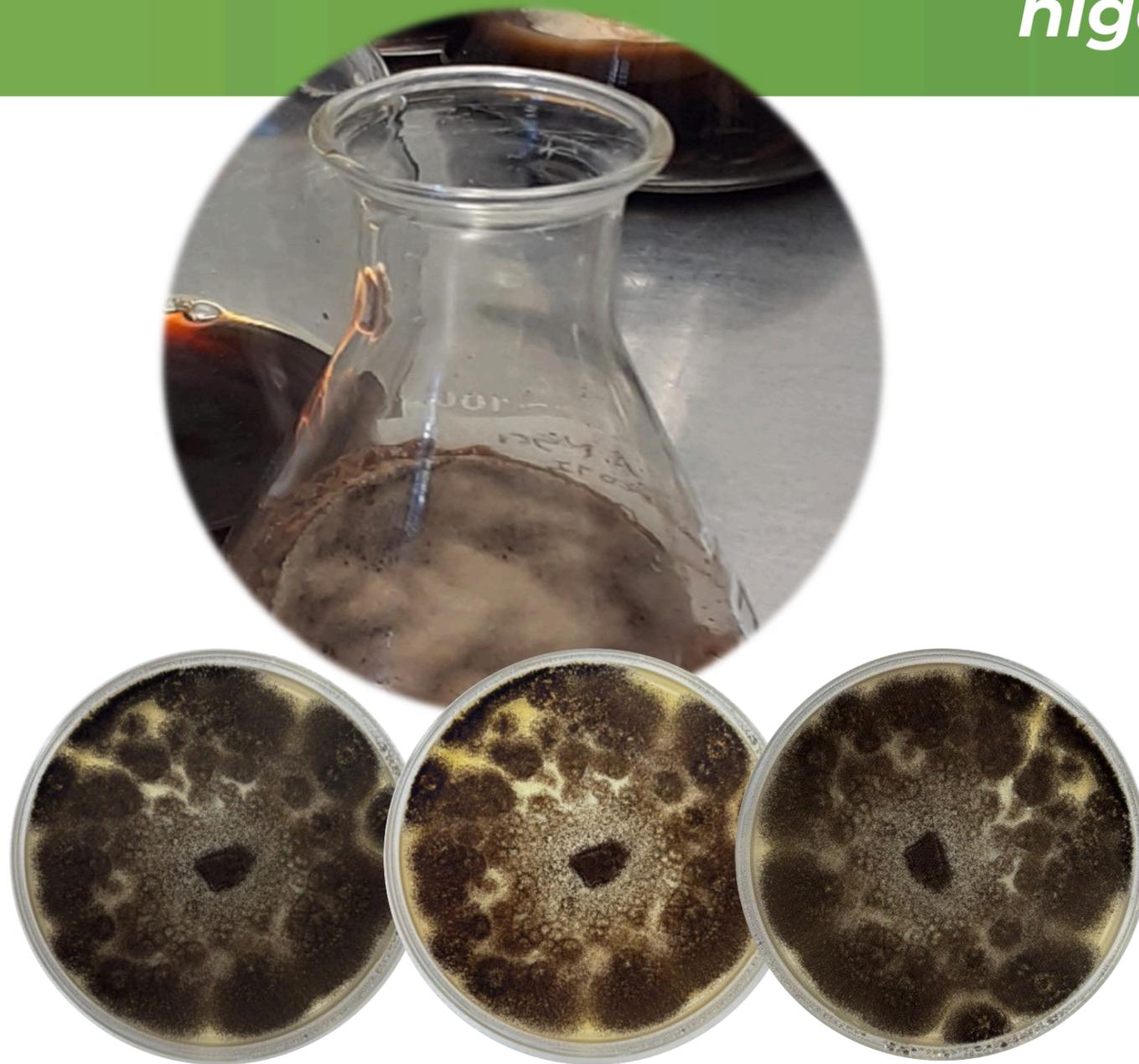
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## Innovation in Nematode Management: HOW?

# Development of a Biological Product with *Aspergillus niger* (CECT 21308)



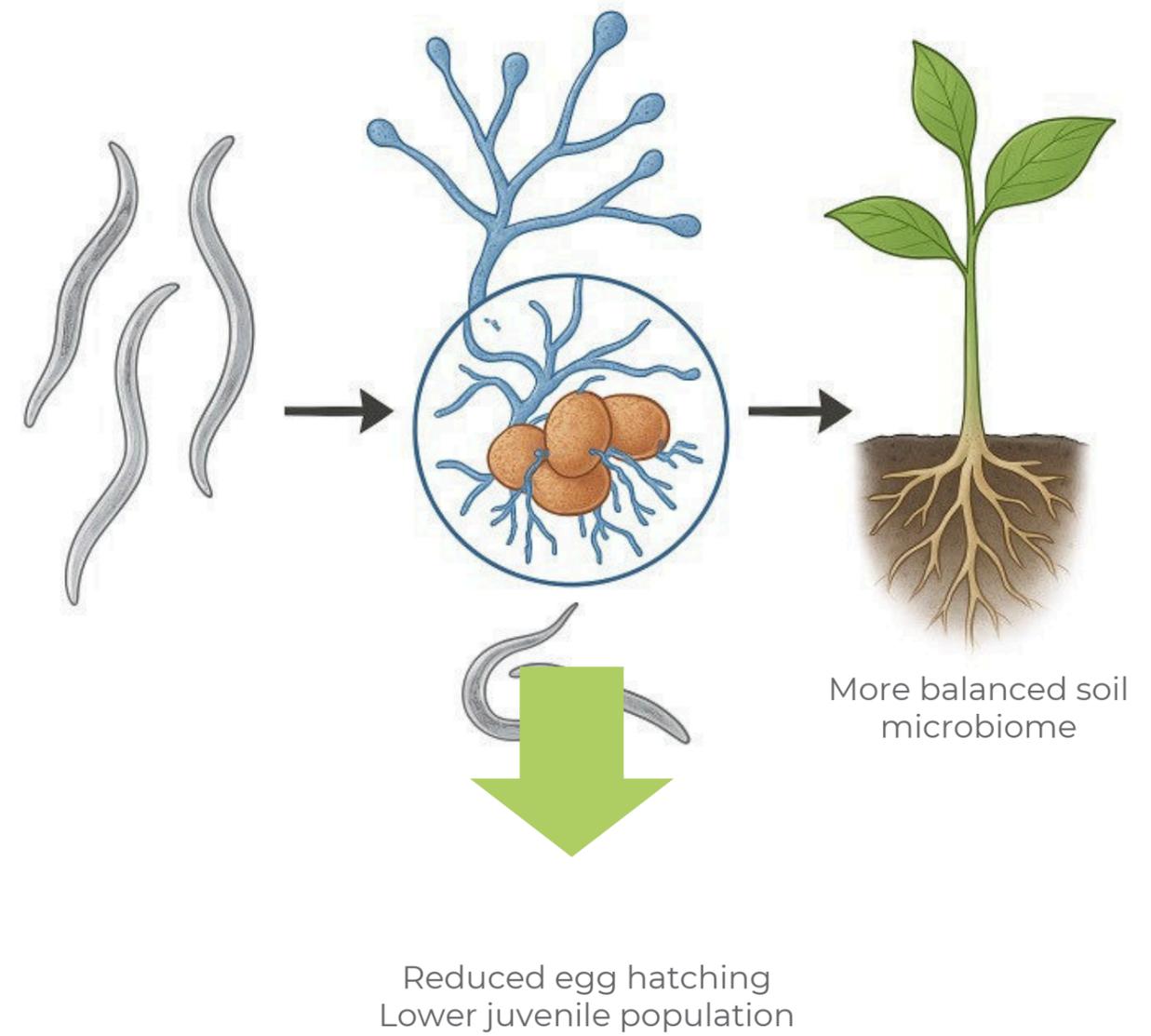
## ***Aspergillus niger* can grow :**

Temperature range between 20 °C and 45 °C  
Tolerate a pH range between 2 and 9

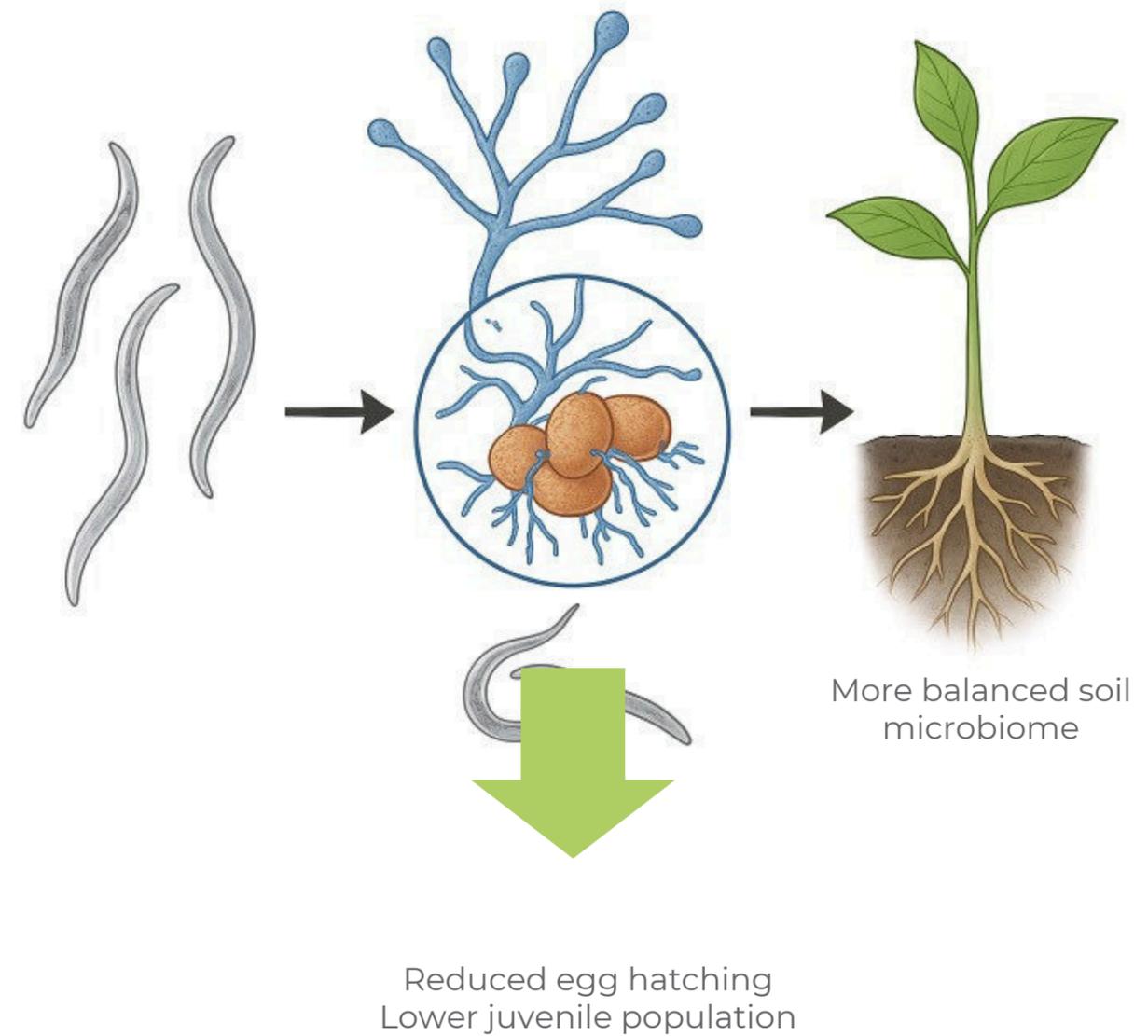
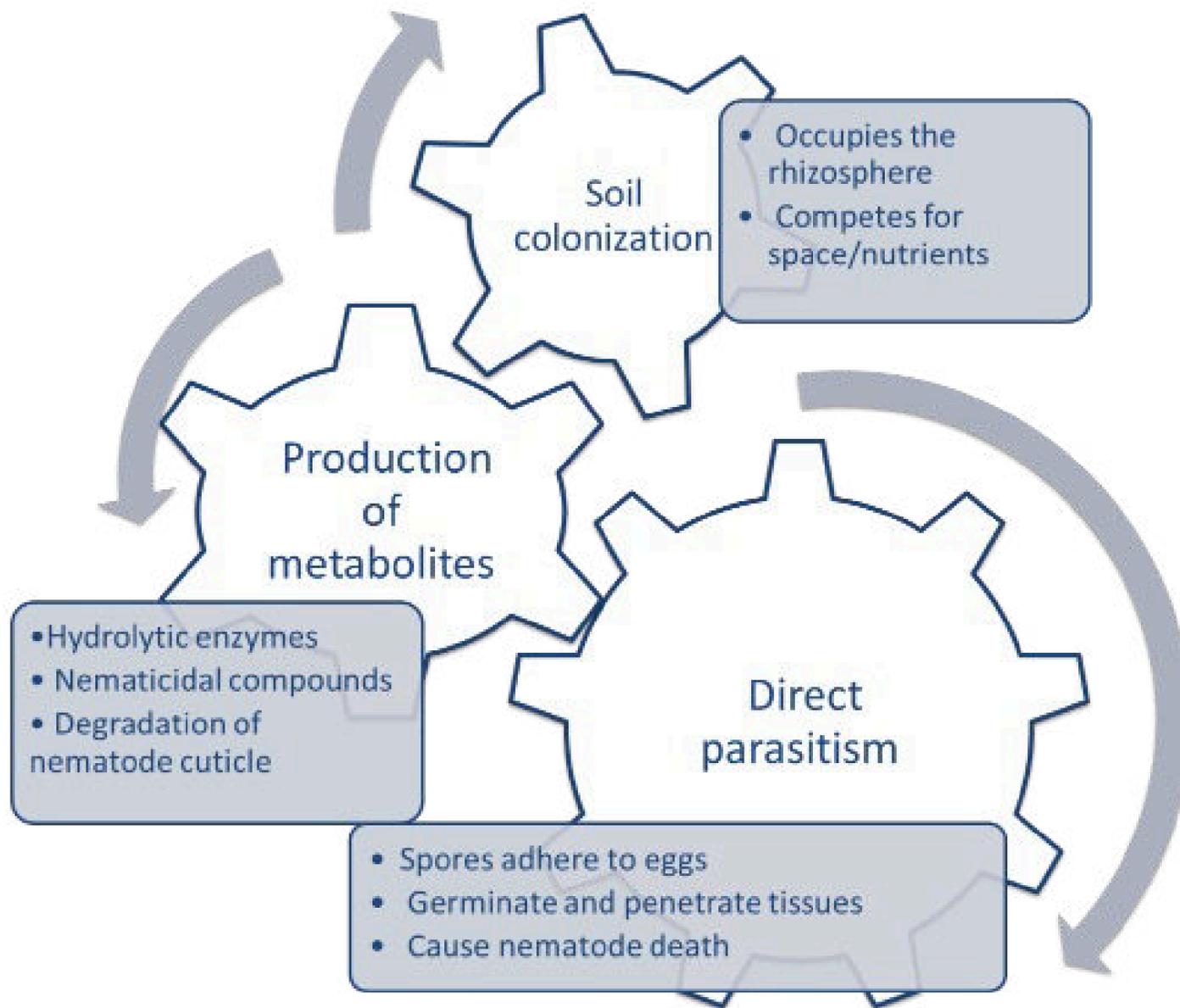
This fungus can adapt to different conditions and survive in hostile environments, mainly acidic ones, including contaminated soil and water sources.



# Mechanism of Action of *Aspergillus niger*



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# How we assess it



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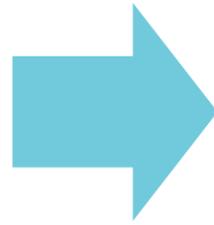
# How we assess it



## In vitro (Eggs/ Juveniles/Cysts)

- Direct contact solutions with the nematodes.
- Assessments based on the mortality or behaviour of nematodes.

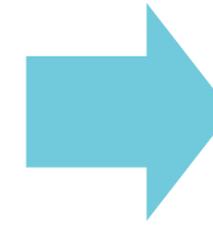
*Meloidogyne* spp. 100 eggs per /unit  
The experimental units were Petri dishes.



## Nepot test

- Soil with a known population of plant parasitic nematodes like *Tylenchulus*

Plant-parasitic nematodes  
290 J2 + 25 *Tylenchulus*  
100 cc soil / replica



## Pots

- Plants transplanted on inoculated soil in order to know the impact of the exudate in the reproduction of the nematodes

2000 eggs of *Meloidogyne incognita*  
500 cc soil / replica  
Tomato seedlings



# Experimental Results: In vitro (Eggs/ Juveniles/Cysts)

Study of the nematicidal action of the product against the nematode *Meloidogyne spp* at the egg stage.

Grupa Farmakol  
**NEVAL**  
More than Labs

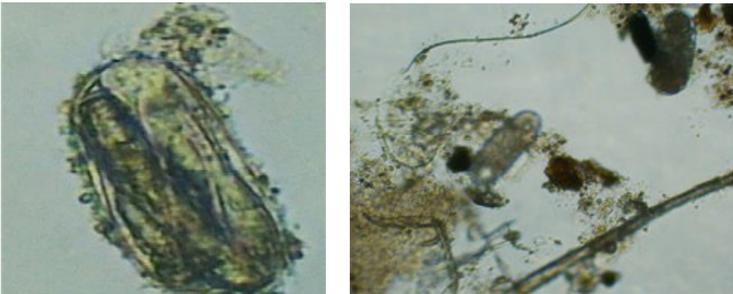
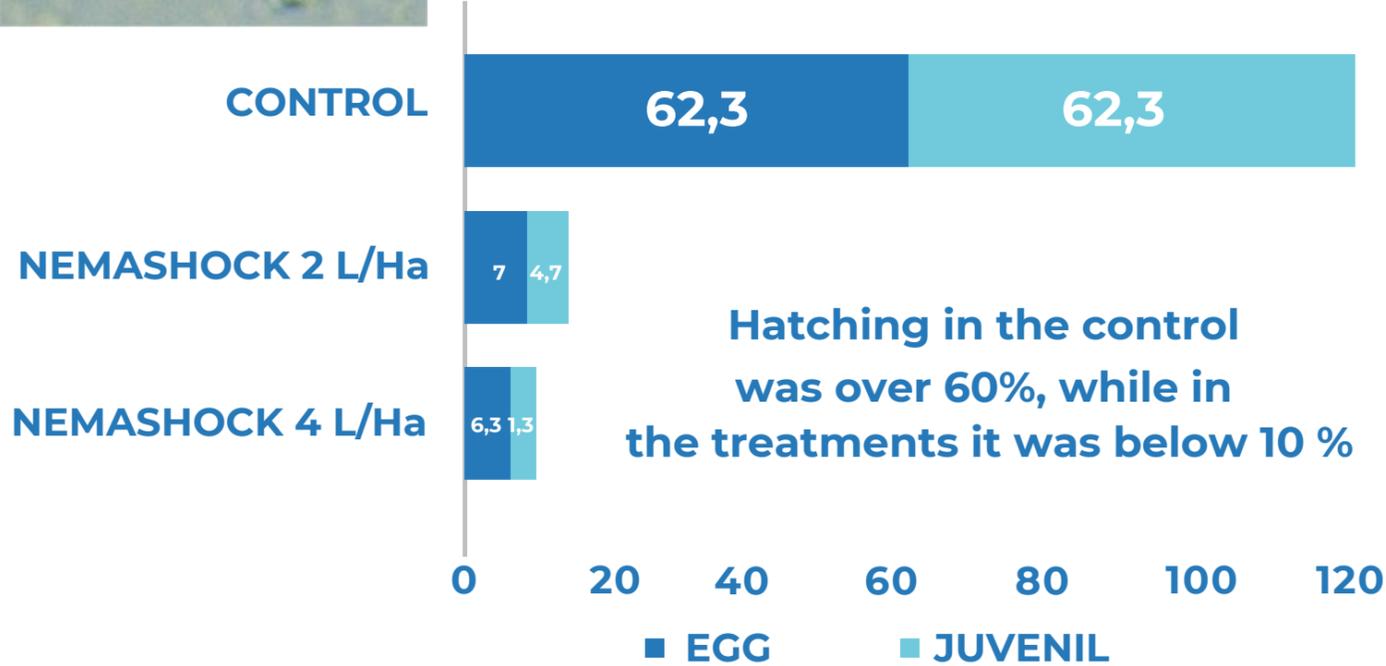


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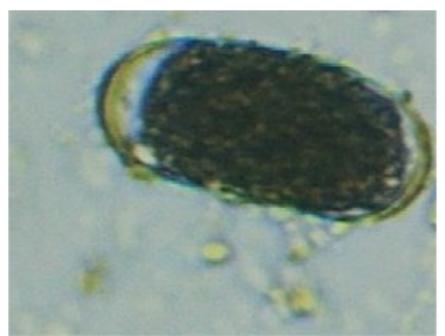


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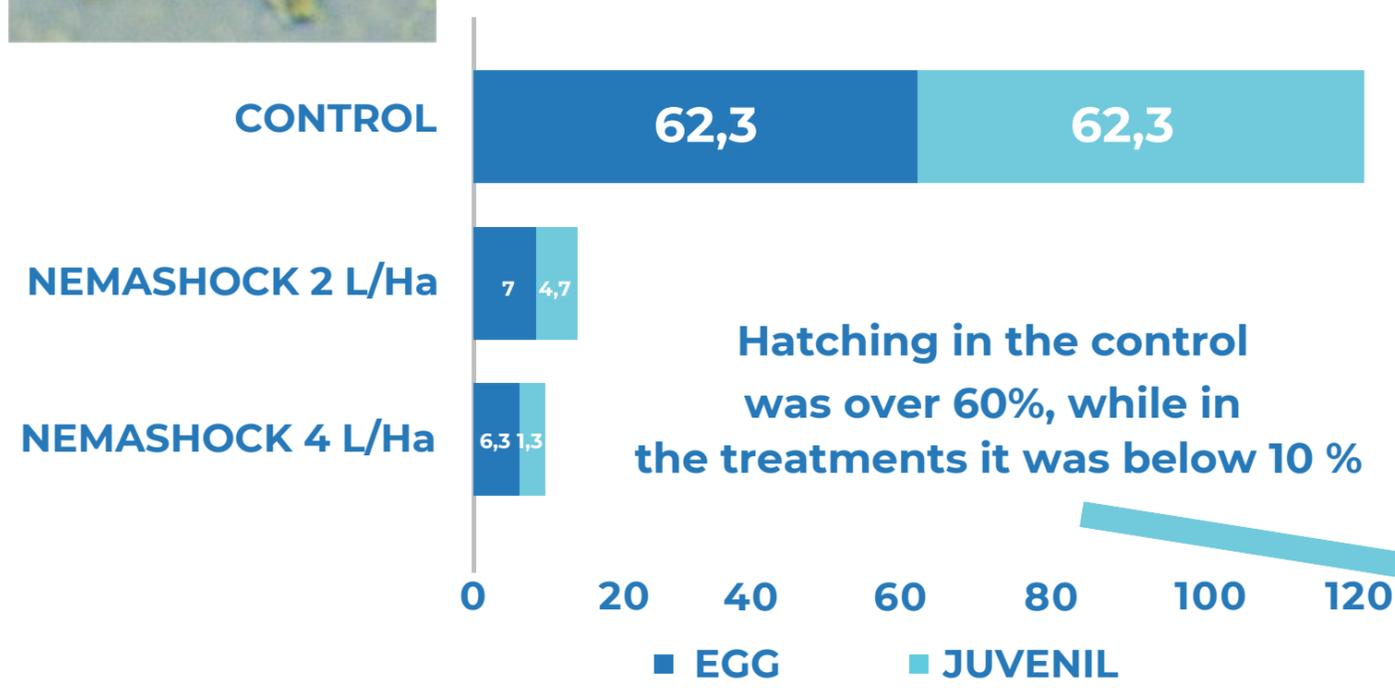


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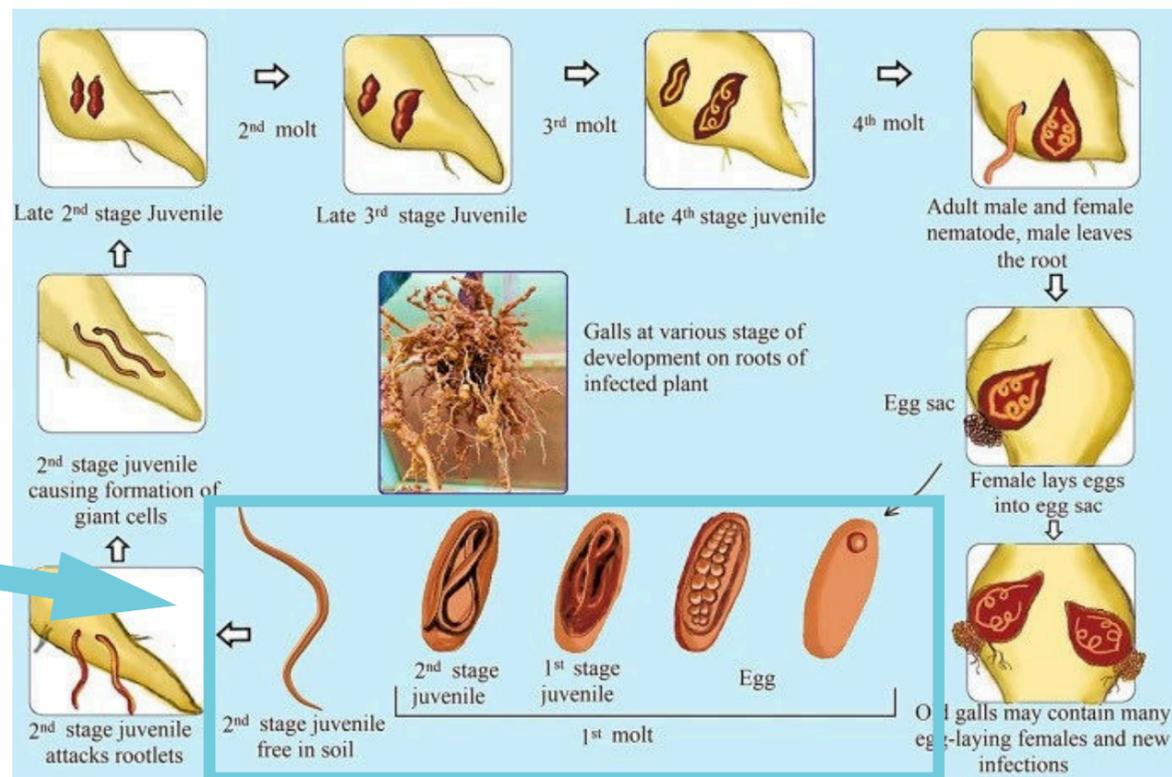
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Hatching in the control was over 60%, while in the treatments it was below 10 %



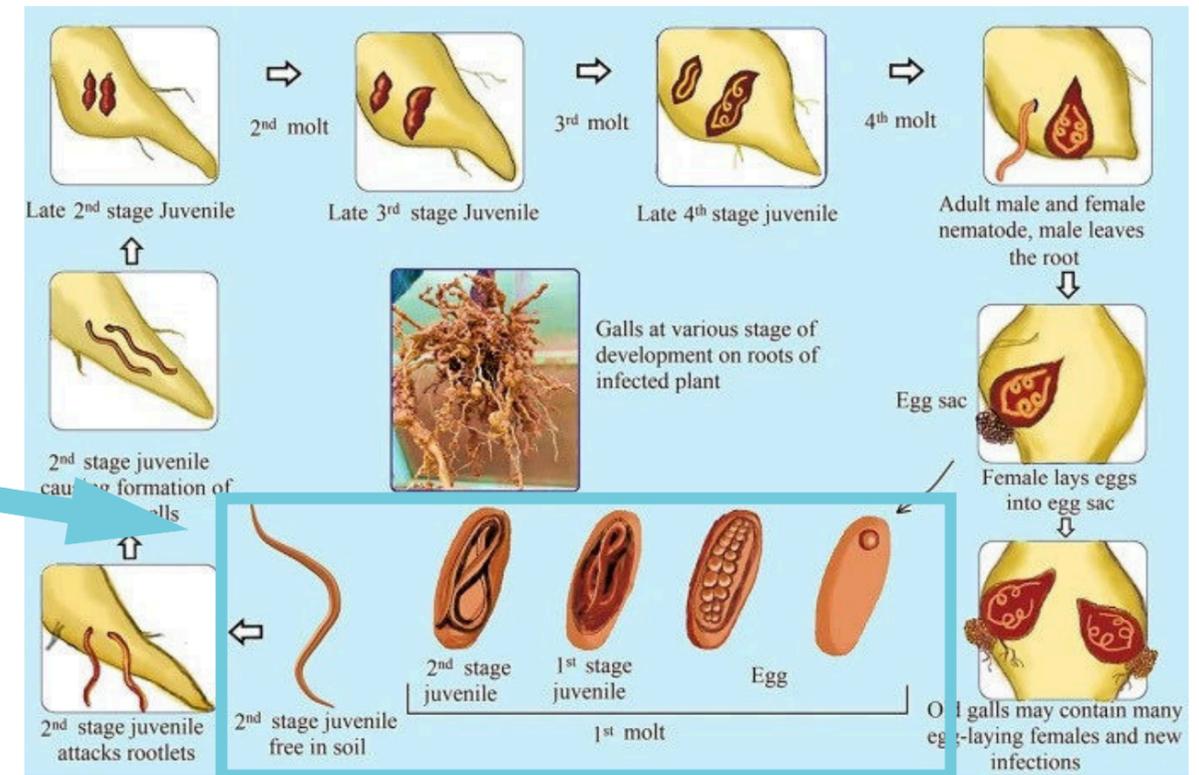
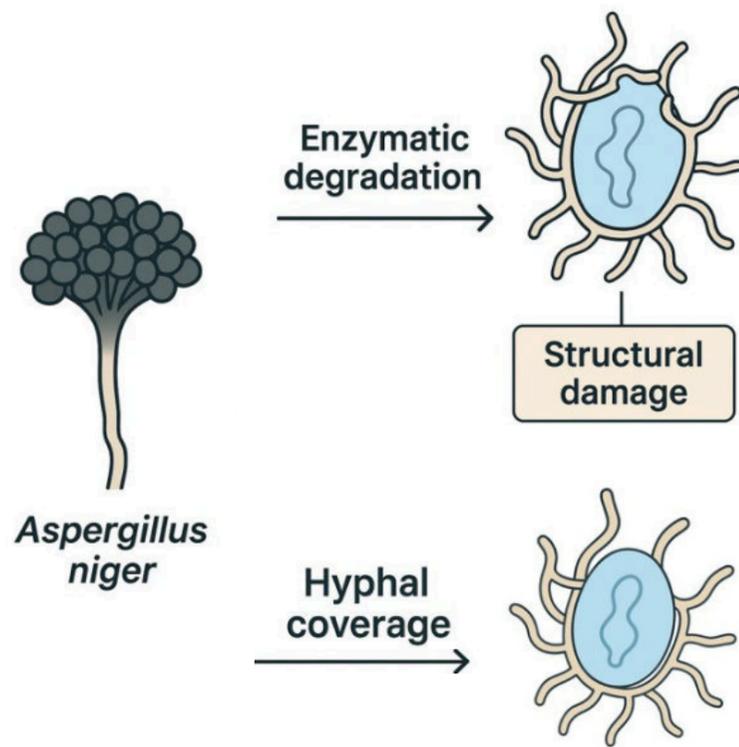
Life cycle of root-knot nematodes of the genus *Meloidogyne*<sup>a</sup>

<sup>a</sup>Source: Pradhan, P., Naresh, P., Barik, S. et al. Breeding for root-knot nematode resistance in fruiting Solanaceous vegetable crops: a review. Euphytica 219, 71 (2023). <https://doi.org/10.1007/s10681-023-03204-2>

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# Experimental Results: Nepot test

Study of nematicidal action against plant-parasitic nematodes  
*Tylenchulus semipenetrans*

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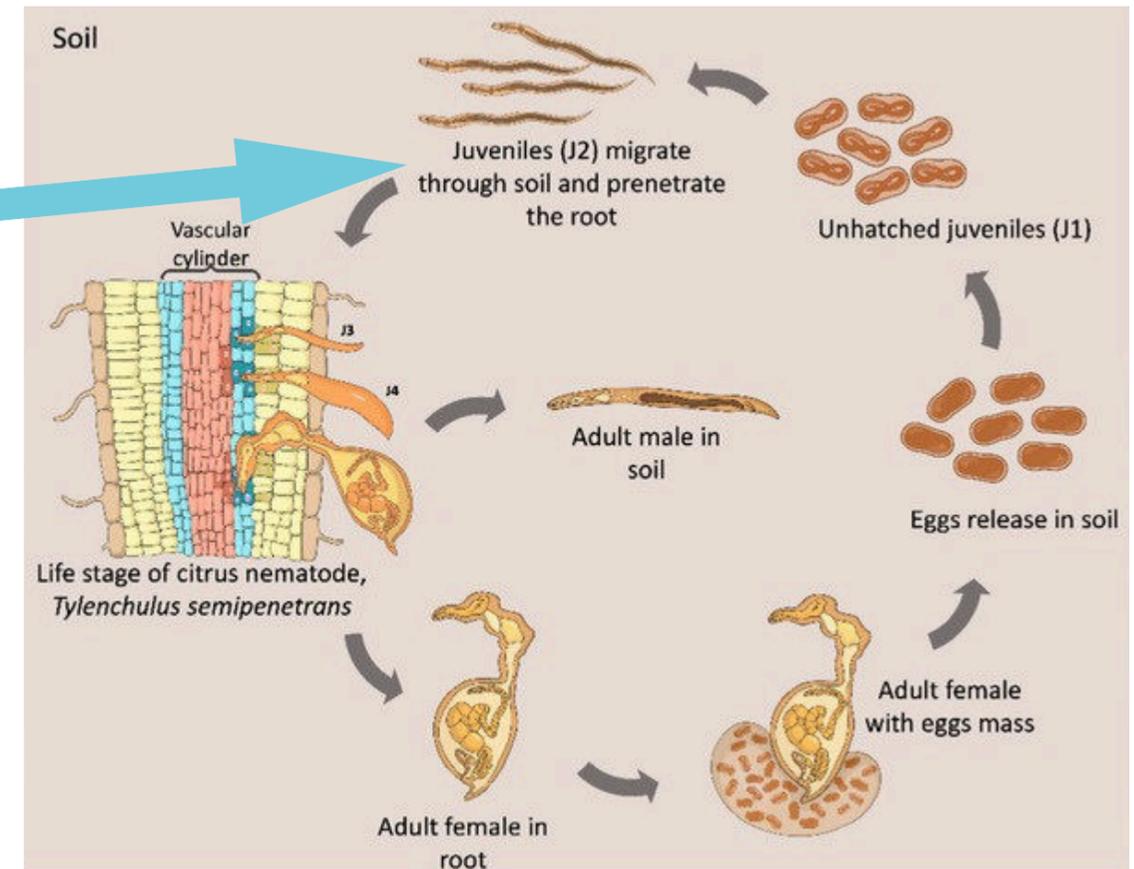
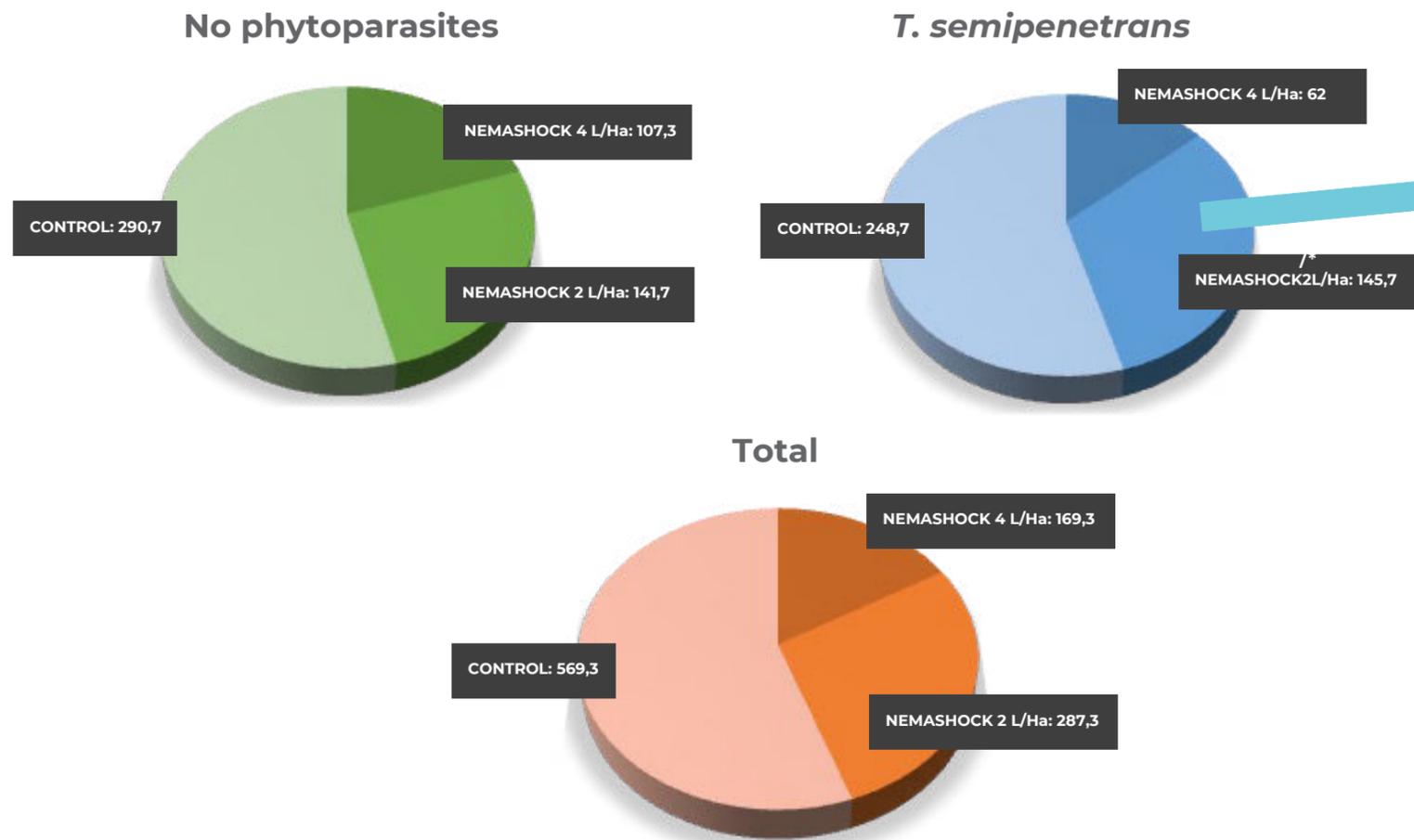
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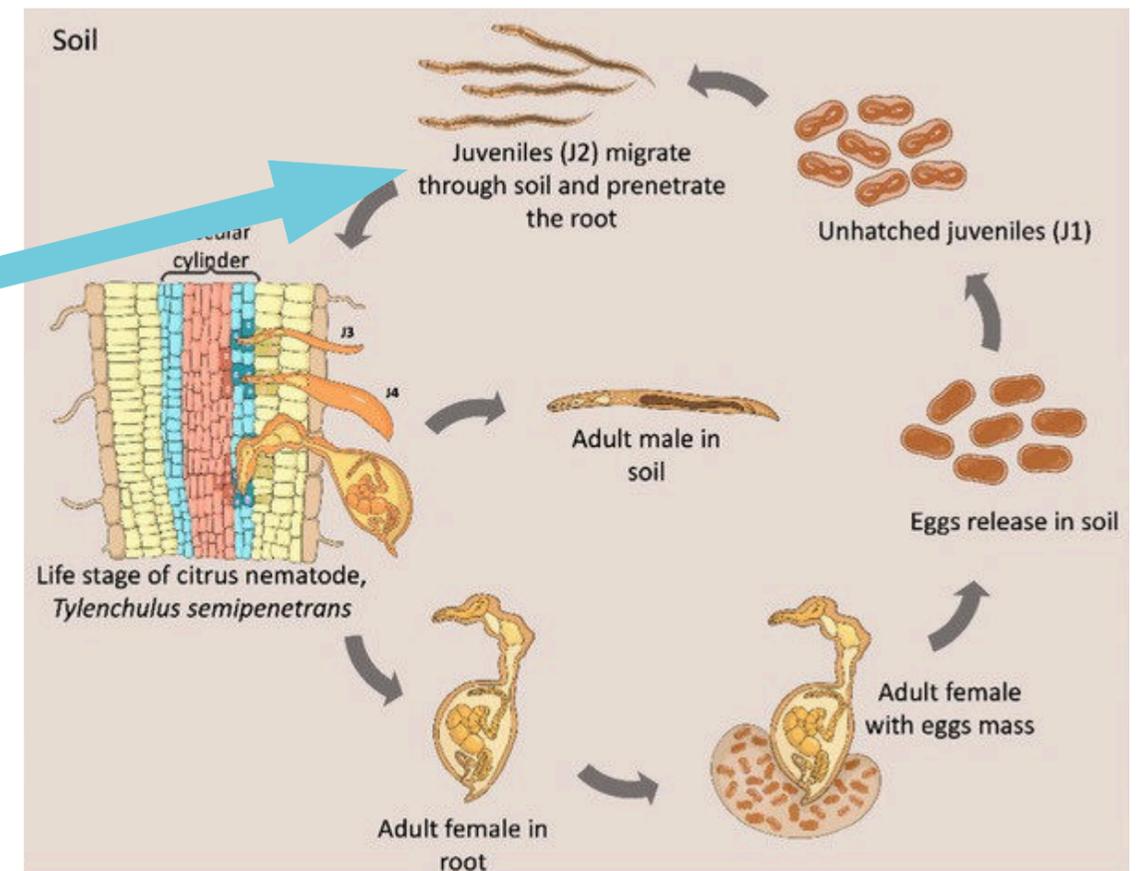
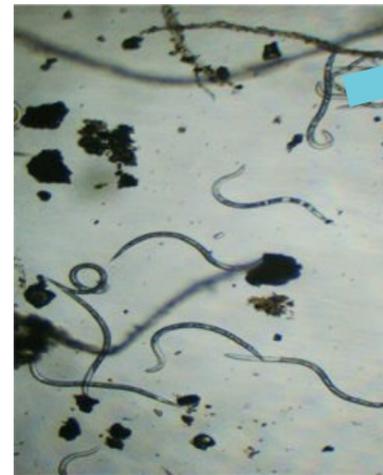
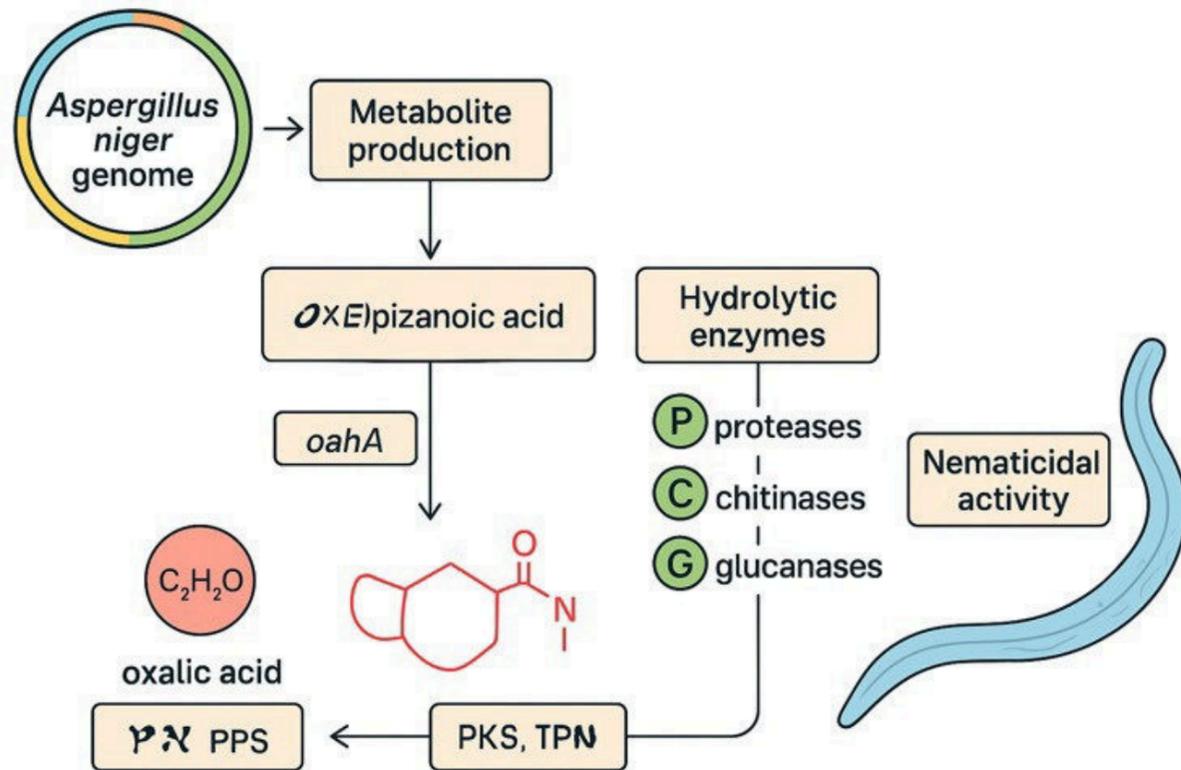
The generalized life cycle of *T. semipenetrans*

Source: Baniya, A.; Zayed, O.; Ardpairin, J.; Seymour, D.; Dillman, A.R. Current Trends and Future Prospects in Controlling the Citrus Nematode: *Tylenchulus semipenetrans*. *Agronomy* 2025, 15, 383. <https://doi.org/10.3390/agronomy15020383>

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Bioassay of efficacy for the control of the nematode *Meloidogyne incognita*



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CONTROL



NEMASHOCK 1L / Ha



NEMASHOCK 2L / Ha



NEMASHOCK 4L / Ha

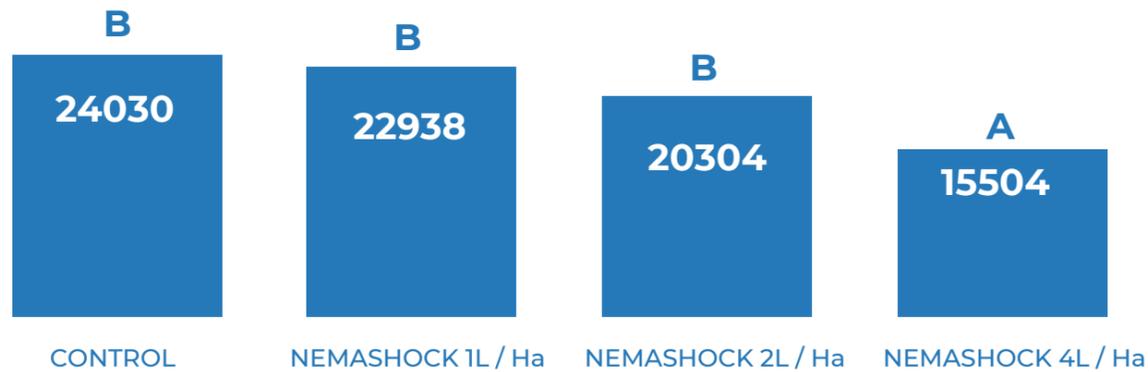


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Population of eggs and J2 of *Meloidogyne sp.* on the root

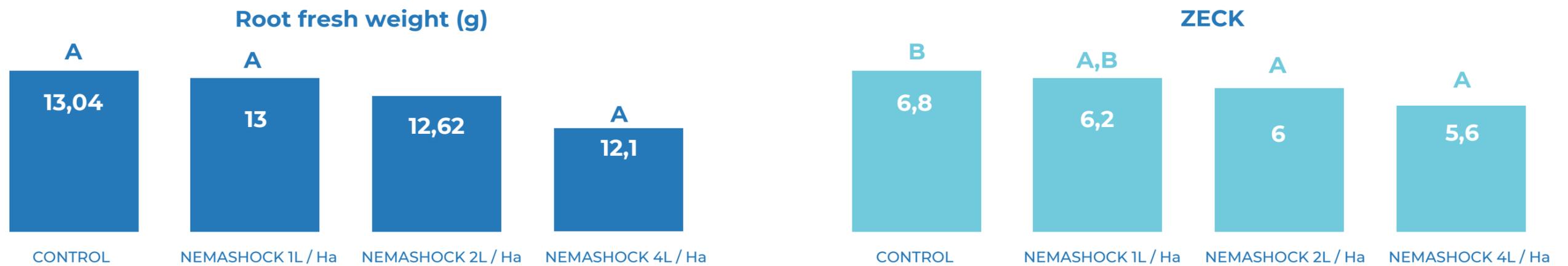


Population of juveniles 2 of *Meloidogyne sp.* in the soil



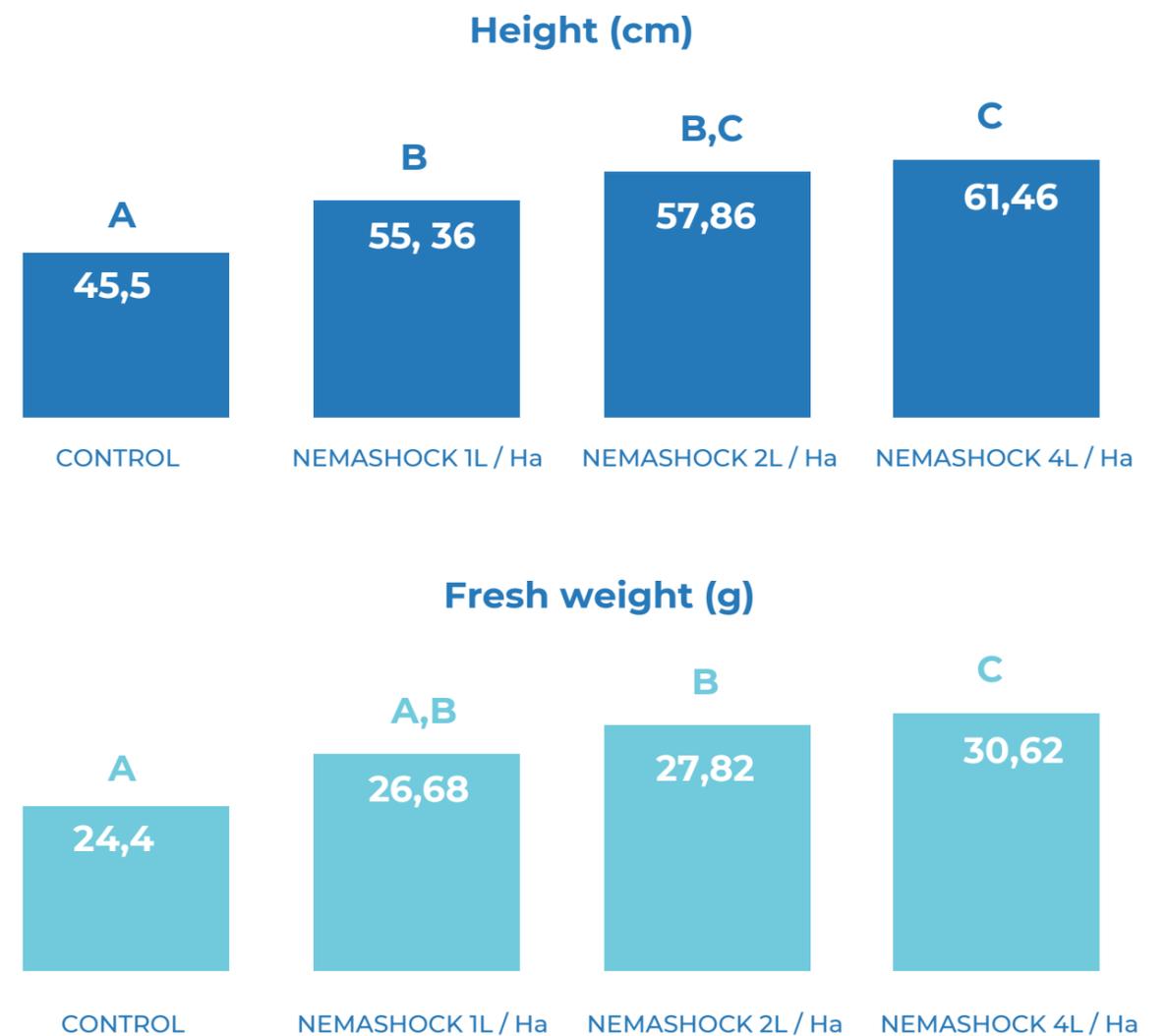
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# key points and benefits

## Innovation consists of:

Using the product Nemashock, which contains the fermented microorganism *Aspergillus niger* (CECT-21308), as a biological control agent for controlling eggs and juveniles of Phytopathogenic Nematodes through hyphal adhesion and structural damage caused by its secondary metabolites.

### How It Works:

1. Fungal spores germinate near nematode eggs.
2. Hyphae grow and wrap around the egg surface.
3. Mechanical pressure causes eggshell deformation and death

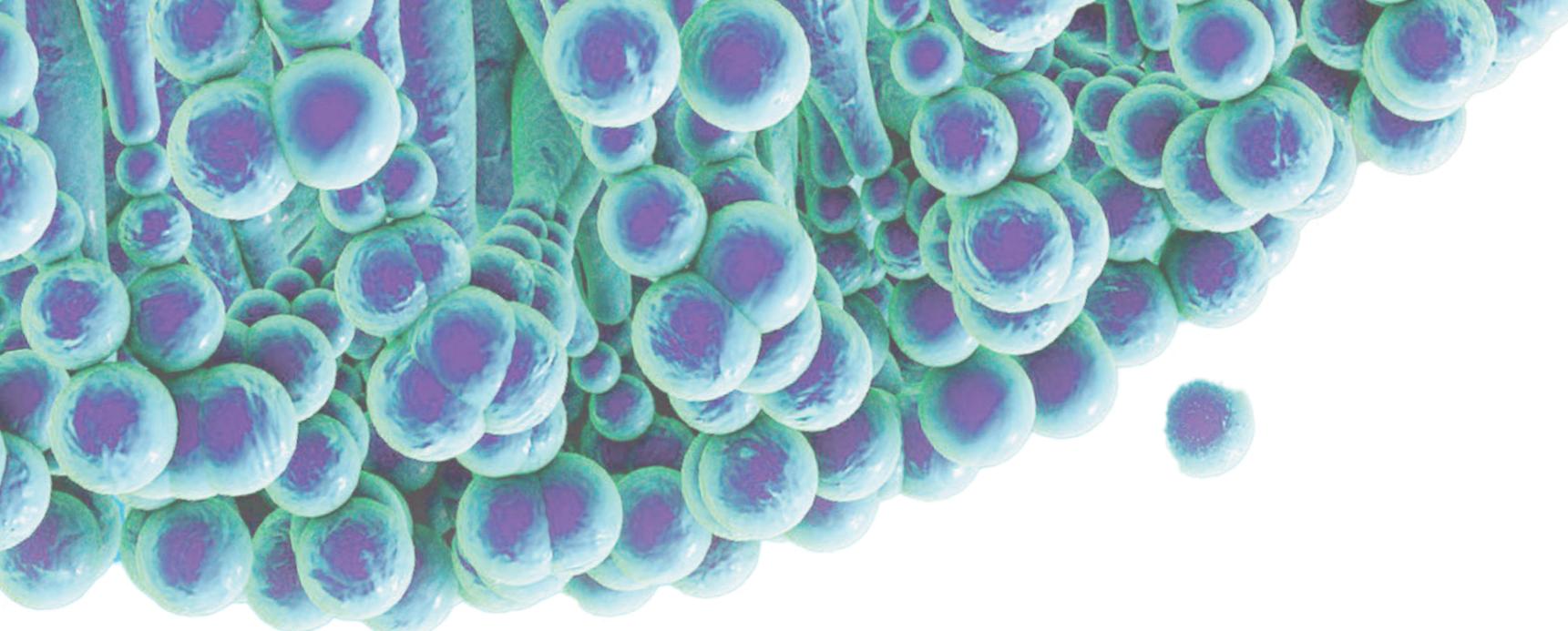


Image: Soil fungus conoides with entrapped nematode (credits: William R. West)

### Impact:

1. Eco-friendly and biodegradable.
2. Reduces nematode populations naturally.
3. Compatible with sustainable agriculture practices.
4. A significant reduction in nematode populations in both soil and roots.
5. A decrease in root damage (gall formation).
6. Improved plant growth, demonstrating a clear bio-stimulant effect.
7. Reducing nematode density,
8. Decreasing root galling and damage, and
9. Enhancing plant growth parameters, showing a bio-stimulant effect.





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**Thank you**