

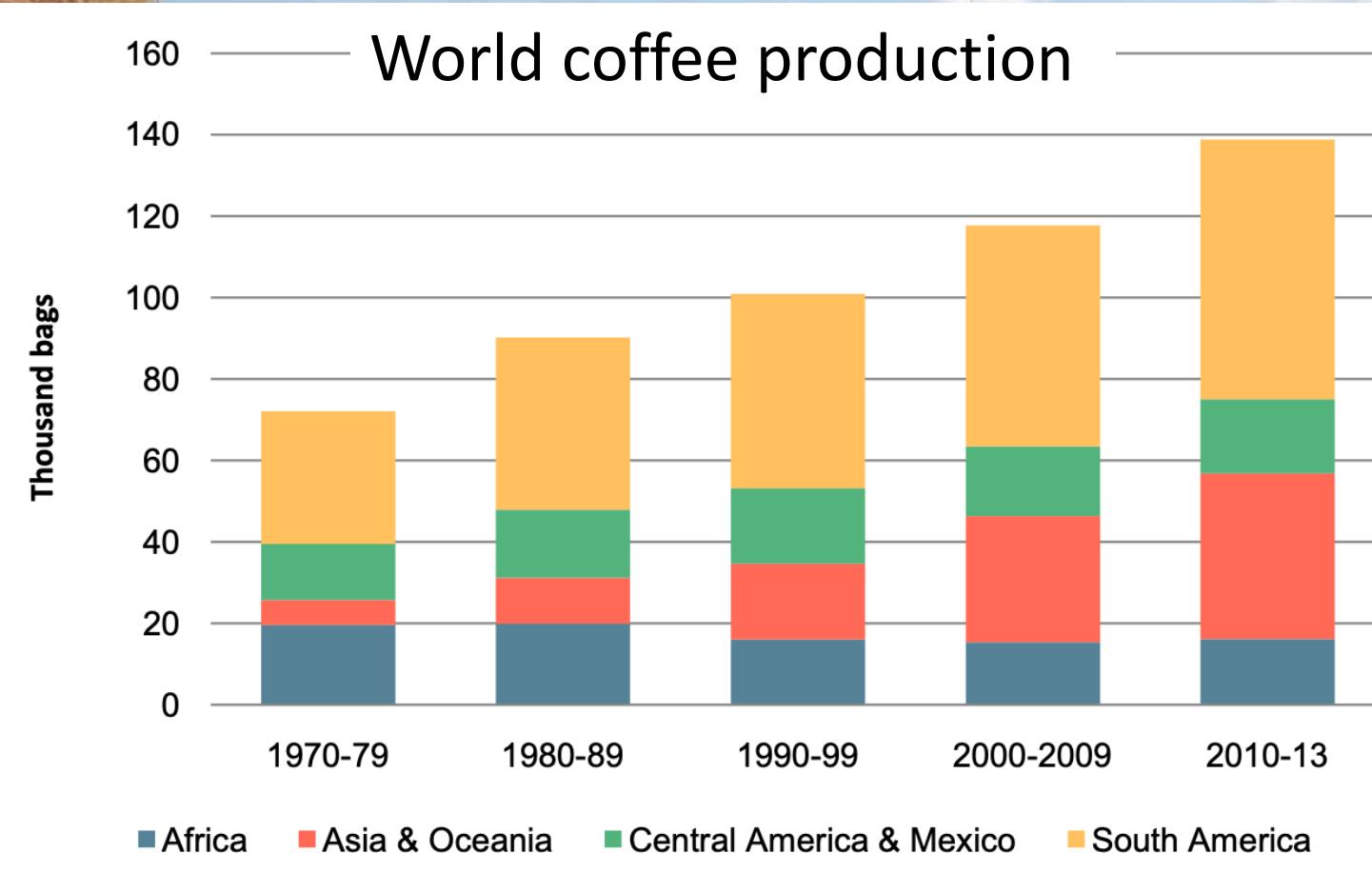
Biological agents to invigorate the health of established coffee trees by managing plant parasitic nematodes.



**Kanan Saikai, C. Oduor, W. Situma,
S. Njoroge, R. Murunde, & D. Coyne**



Looking healthy? They are under the threat from nematodes.



Citation: International Coffee Organization. 2015.

Can we use biological agents to manage nematode pests
on established, heavily infested fields?



Trichoderma asperellum and *Purpureocillium lilacinum* were evaluated on 7 coffee fields.

Drenching:

4 X 10^8 spores/ 20L *T. asperellum*

4 X 10^8 spores/ 20L *P. lilacinus*

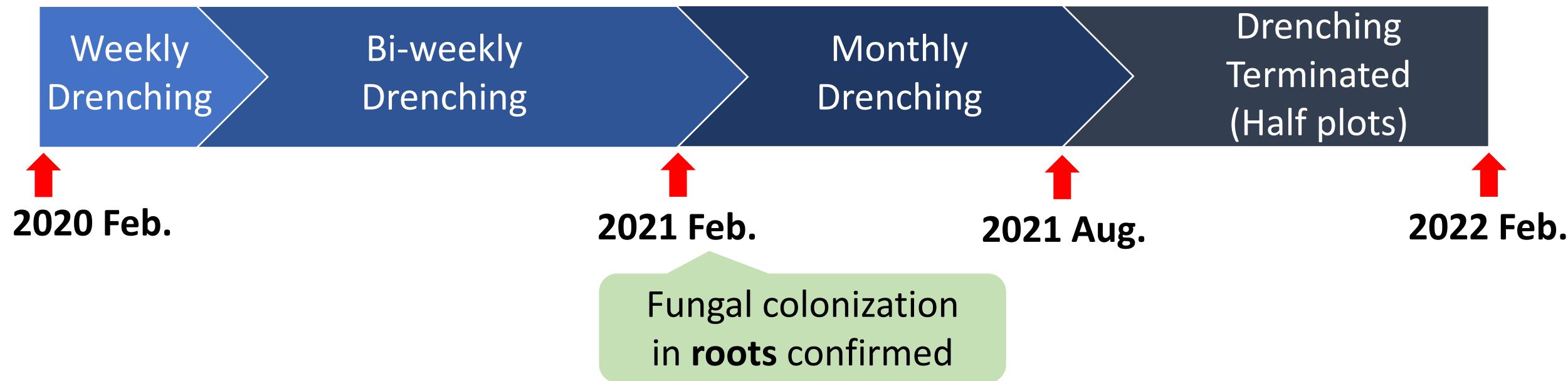
20L water



Sampling:

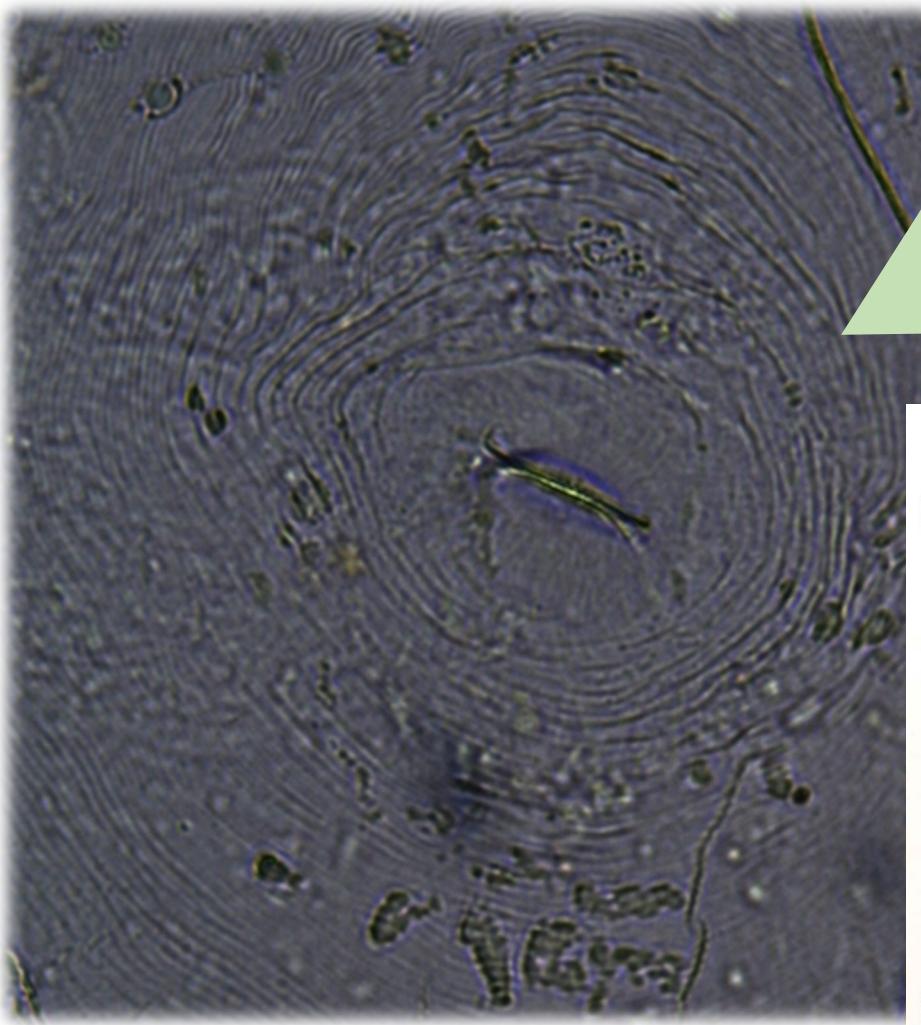
Soil = Every month

Root = Every 6 months

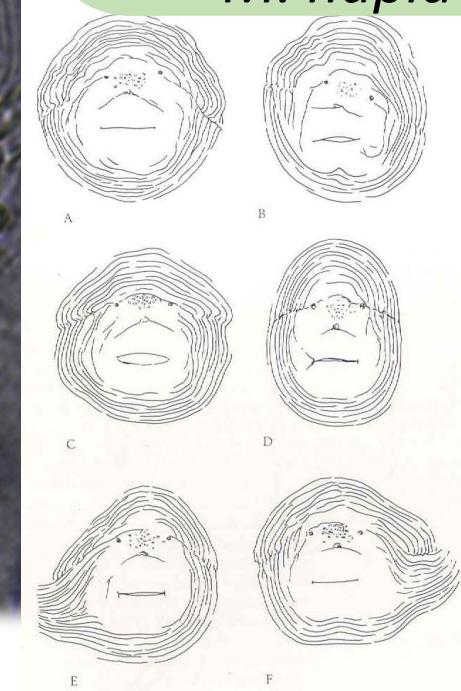


Most abundant nematode was *Meloidogyne hapla*.

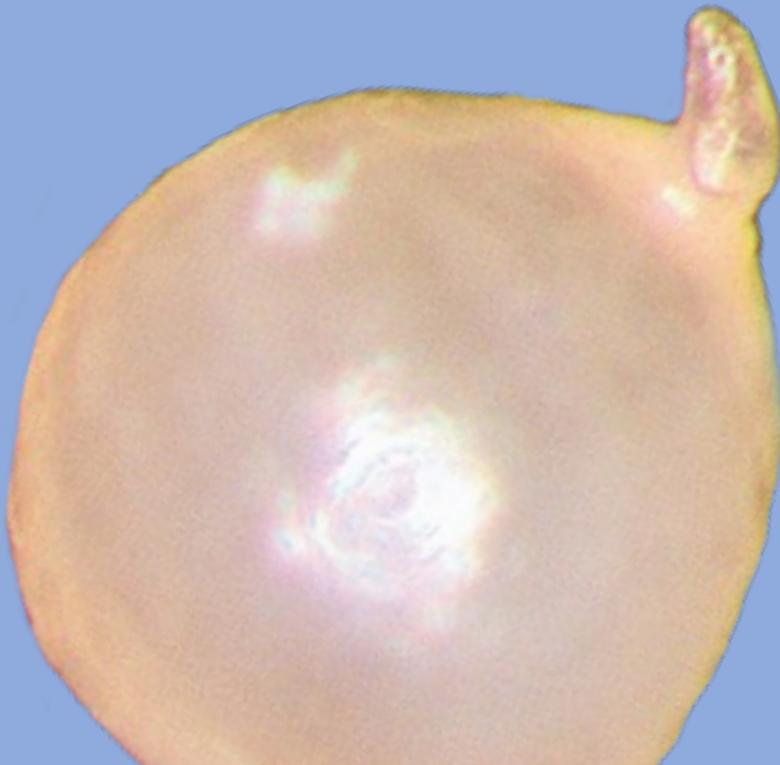
Small galls on coffee roots



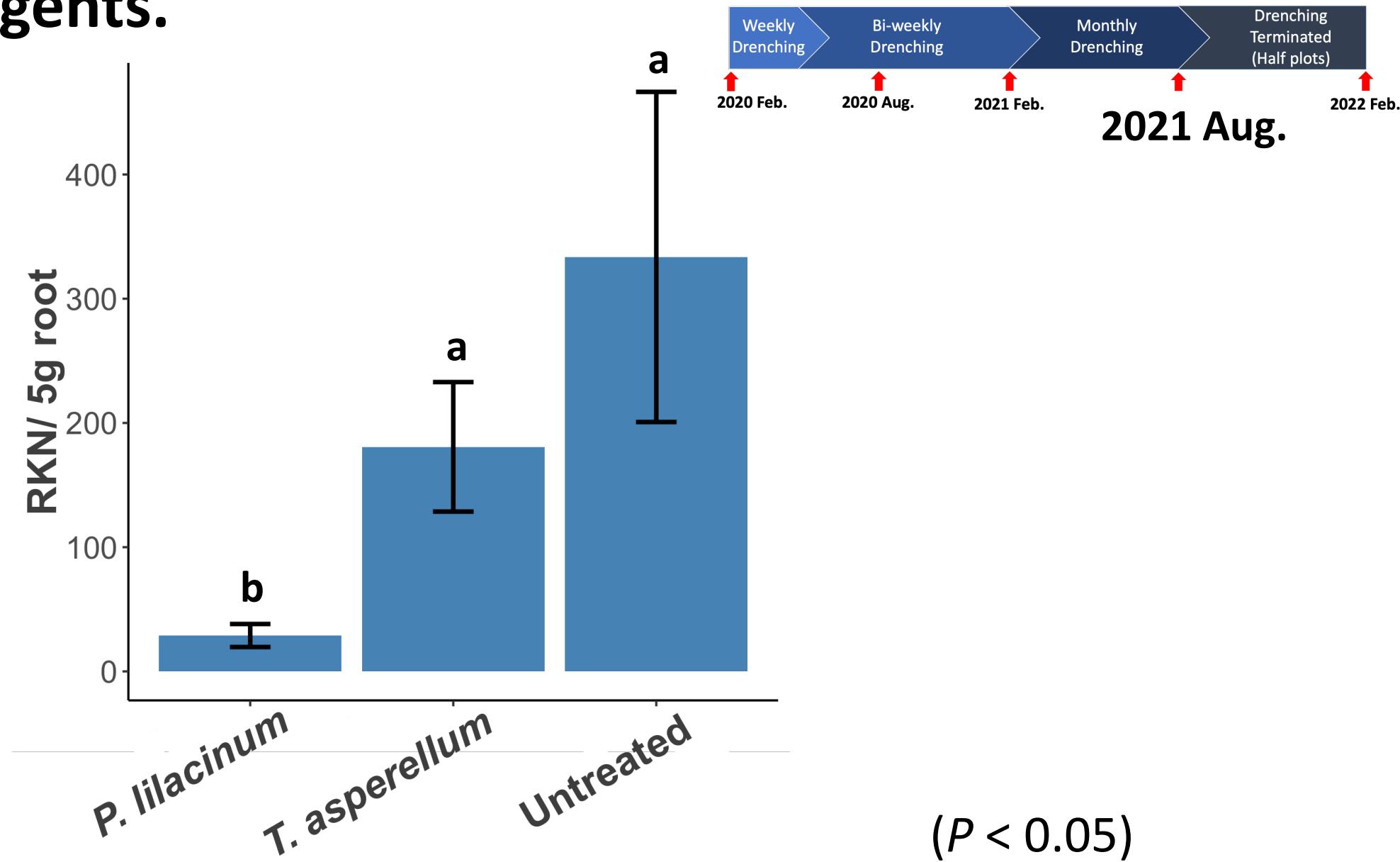
Morphologically
(Perineal pattern)
&
Molecularly
(28S and COI)
identified as
M. hapla



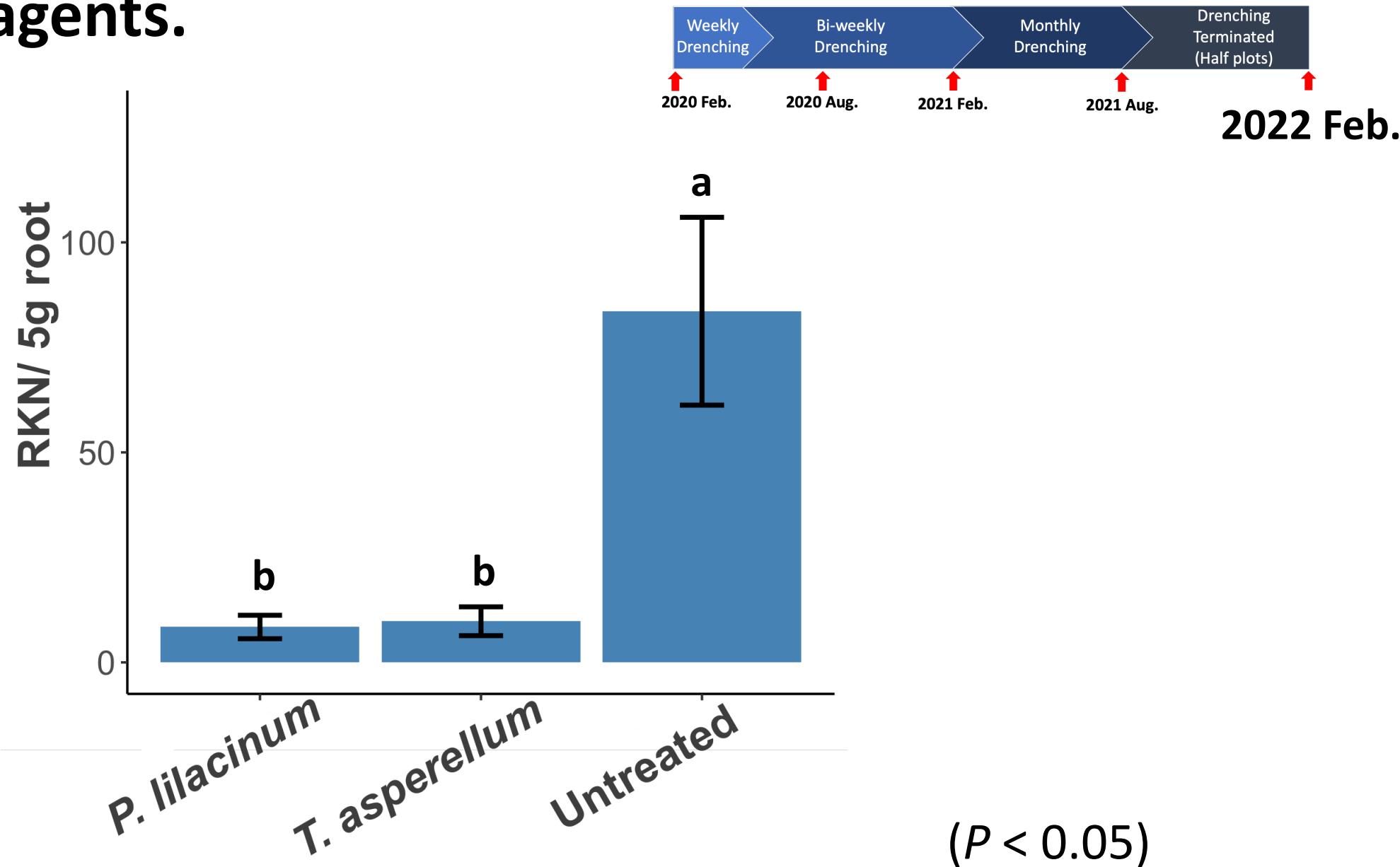
Results



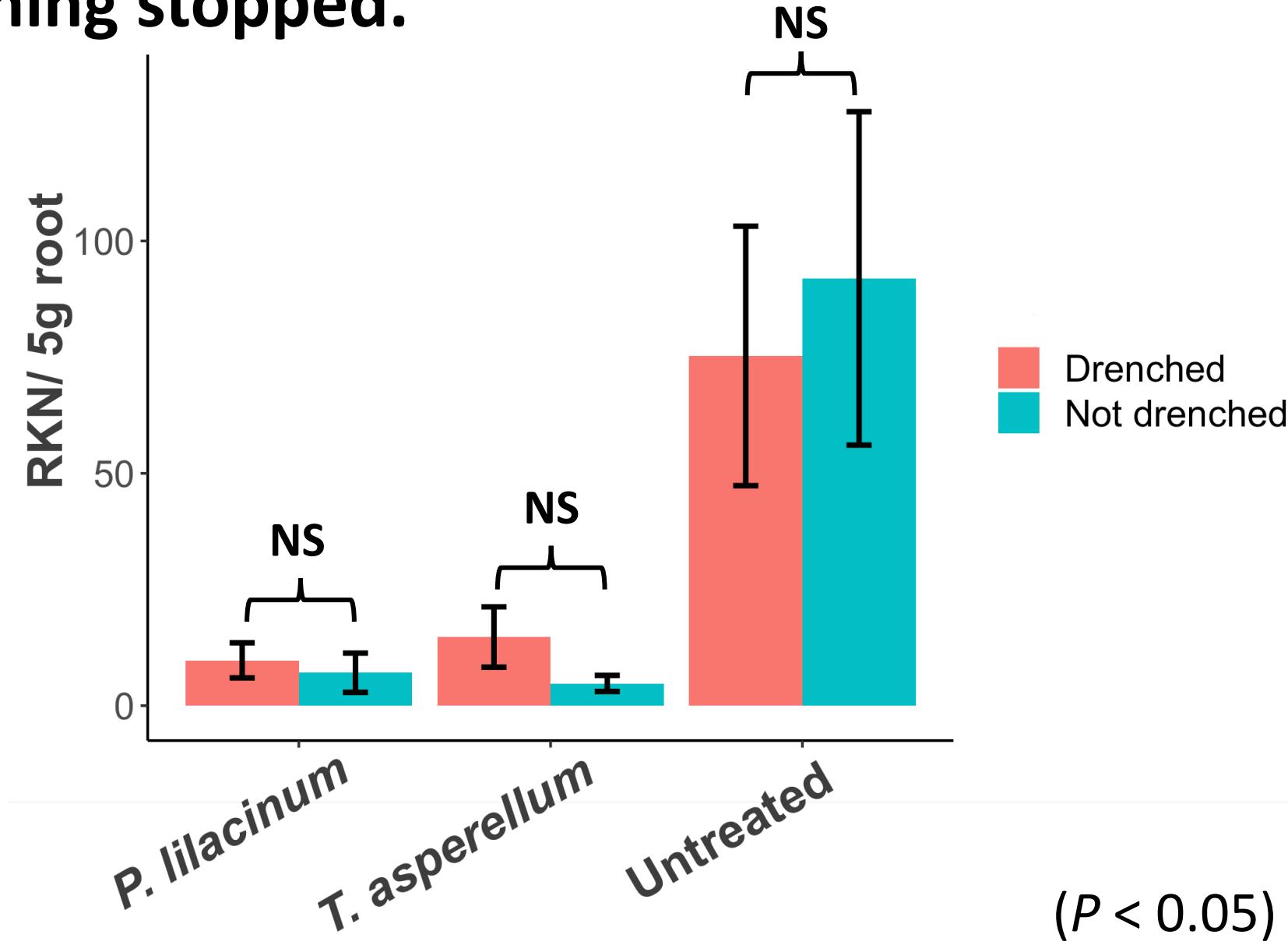
Number of *M. hapla* in roots was significantly reduced by both bioagents.



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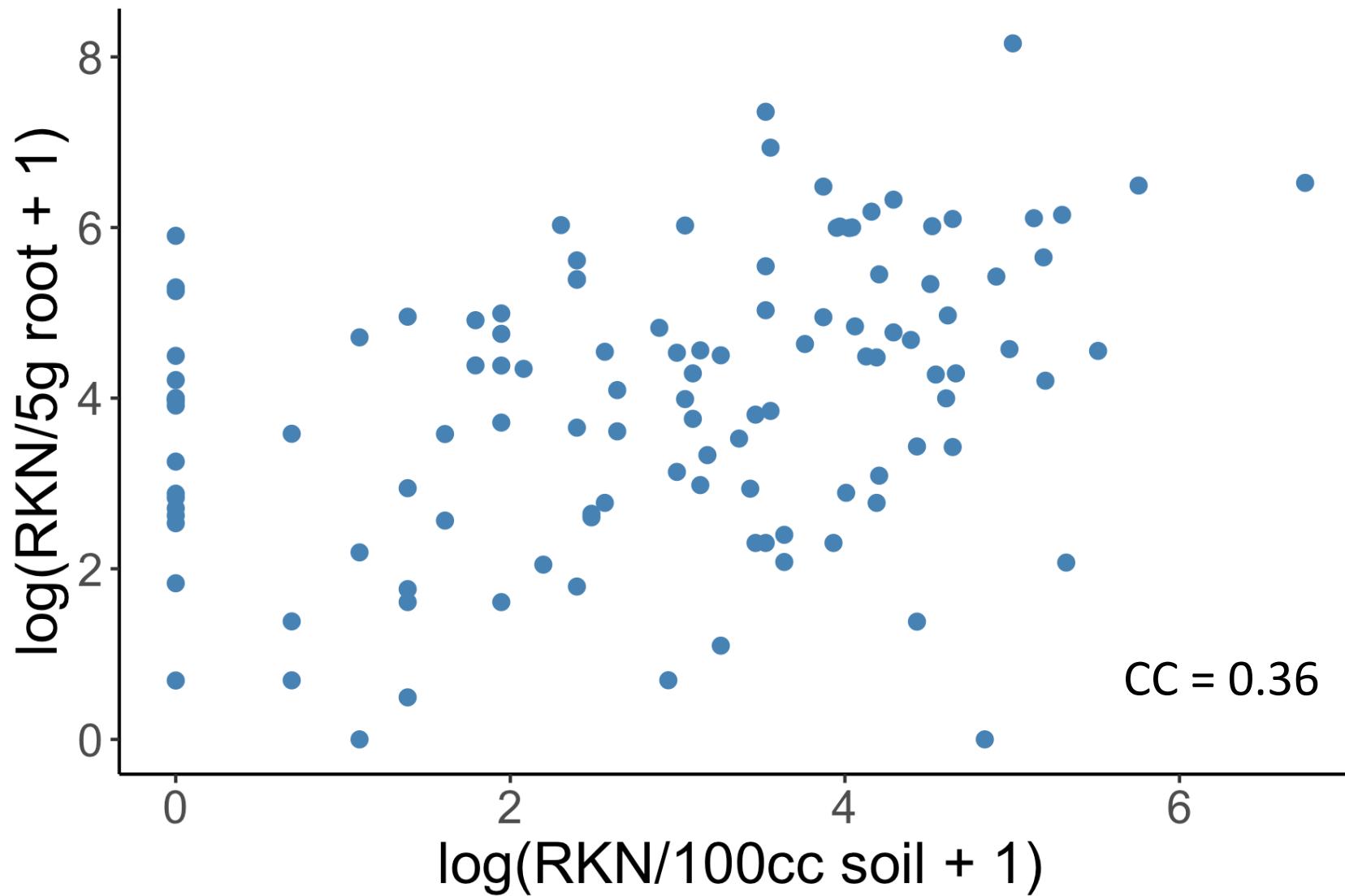


The suppression of bioagents persisted for 6 months after drenching stopped.



No effect of bioagents on RKN in soil.

Weak correlation between RKN in soil and RKN in roots.



What are the effects of the biological agents on soil health?

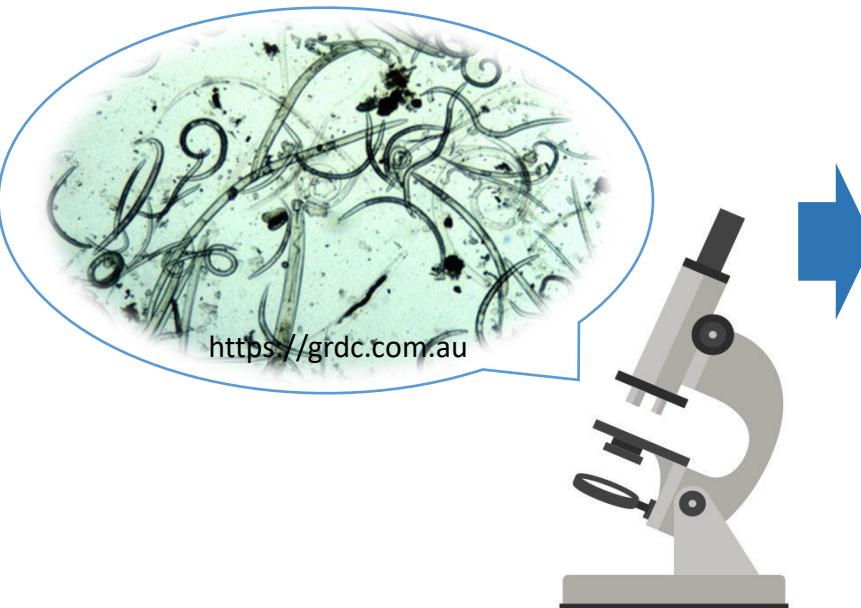


Nematode community was assessed every two months.

Soil samples from coffee fields.



The first 100 encountered nematodes identified to genus level.



Data analyzed using NINJA

NINJA: Nematode INdicator Joint Analysis

A screenshot of the NINJA software interface. At the top, there are navigation links: START, Summary, Feeding types & c-p/p-p, MI family indices, and Food web diagnostics. Below these are buttons for Compost analysis and ABOUT. The main area contains text and dropdown menus for inputting feeding type data for different nematode genera like Axonchium, Ecphyadophora, and Helicotylenchus. There are also sections for fine tuning and a note about default values being based on Yeates et al. (1993). A success message at the top says "Upload successful. Refresh the page to upload a new file. Do you have some questions? Check the FAQs page (at the bottom of this window)".

Upload successful. Refresh the page to upload a new file. Do you have some questions? Check the FAQs page (at the bottom of this window)

Exclude dauer larvae from calculations

Some fine tuning (optional), for advanced users only:

Feeding types designation may be ambiguous. Default values are based on the classification of Yeates et al. (1993) and subsequently obtained data. If you think differently, use the drop-down lists below to perform adjustment.

Axonchium

Herbivores - ectoparasites

Ecphyadophora

Herbivores - epidermal/root hr

Helicotylenchus

Herbivores - semi-endoparasite

If you used NINJA in your research, please refer to it by citing

Sieriebriennikov, B., Ferris, H., and de Goede, R.G.M. (2014) "NINJA: An automated calculation of nematode indicator joint analysis for soil monitoring". European Journal of Soil Biology, 61: 90-93. DOI: 10.1016/j.ejsobi.2014.02.004

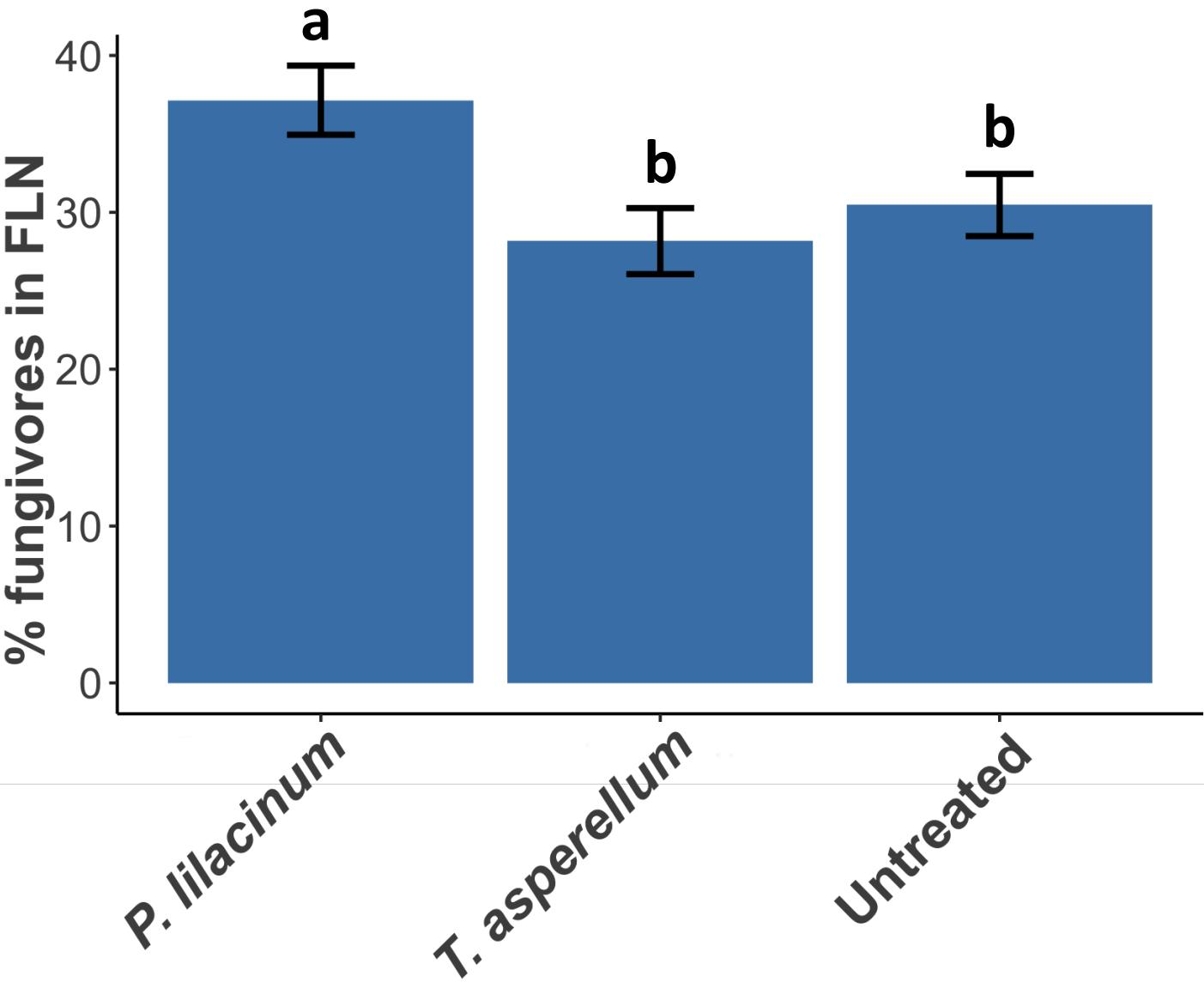
Please note that the database is regularly updated (last update: June 24th, 2021). New taxa are added and modified if new data are published. This may affect the exact values of calculated indices! See the FAQ

The NINJA tool (est. 2013) is produced and maintained by Howard Ferris, Ron de Goede, Sara Sanchez-Moreno, and Bogdan Sieriebriennikov. Howard Ferris, Department of Entomology & Nematology, University of California, Davis, California, USA. Ron de Goede, Department of Soil Biology, Wageningen University & Research, Wageningen, The Netherlands. Sara Sanchez-Moreno, Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria, Madrid, Spain. Bogdan Sieriebriennikov, Department of Biology, New York University, New York, USA.

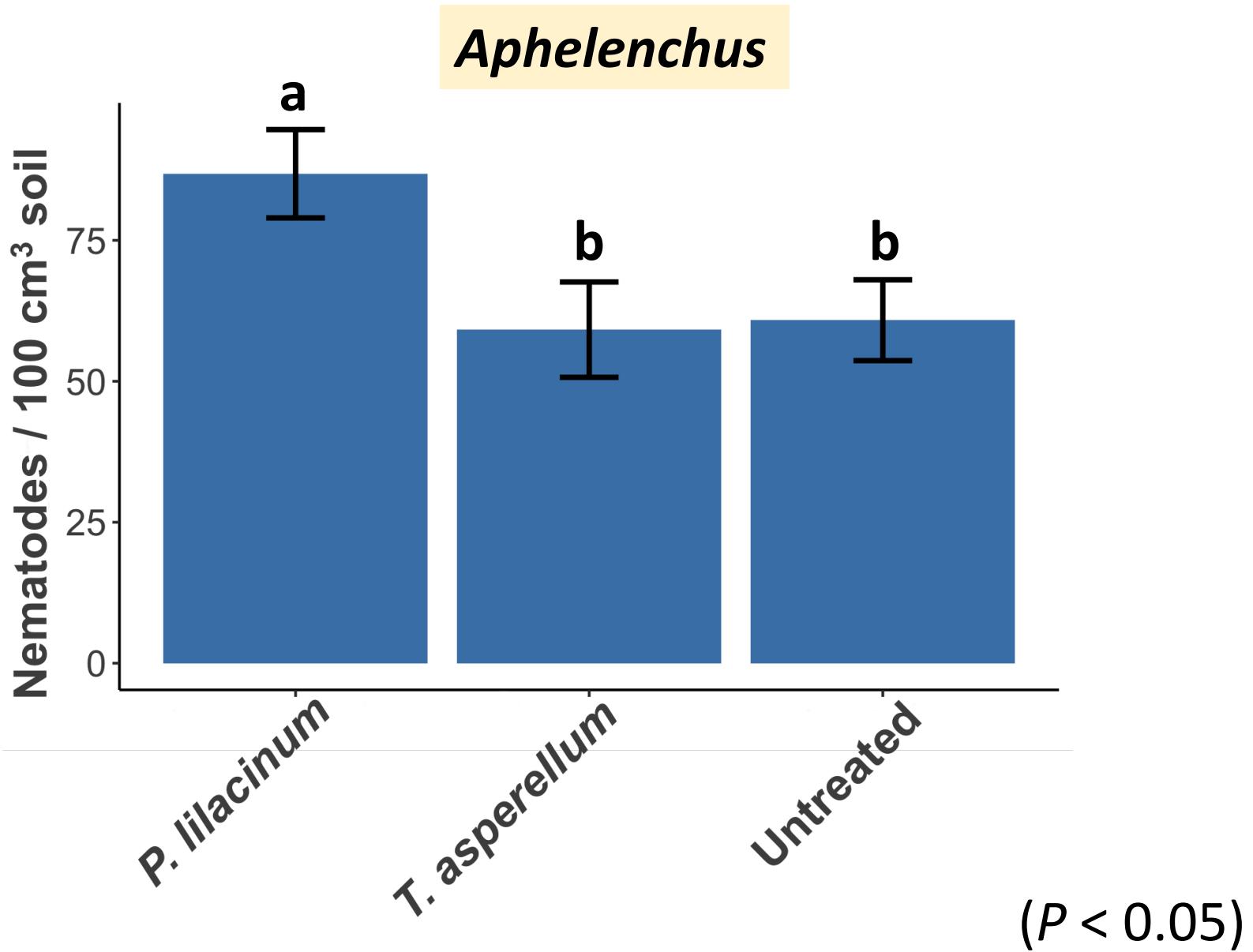
Results



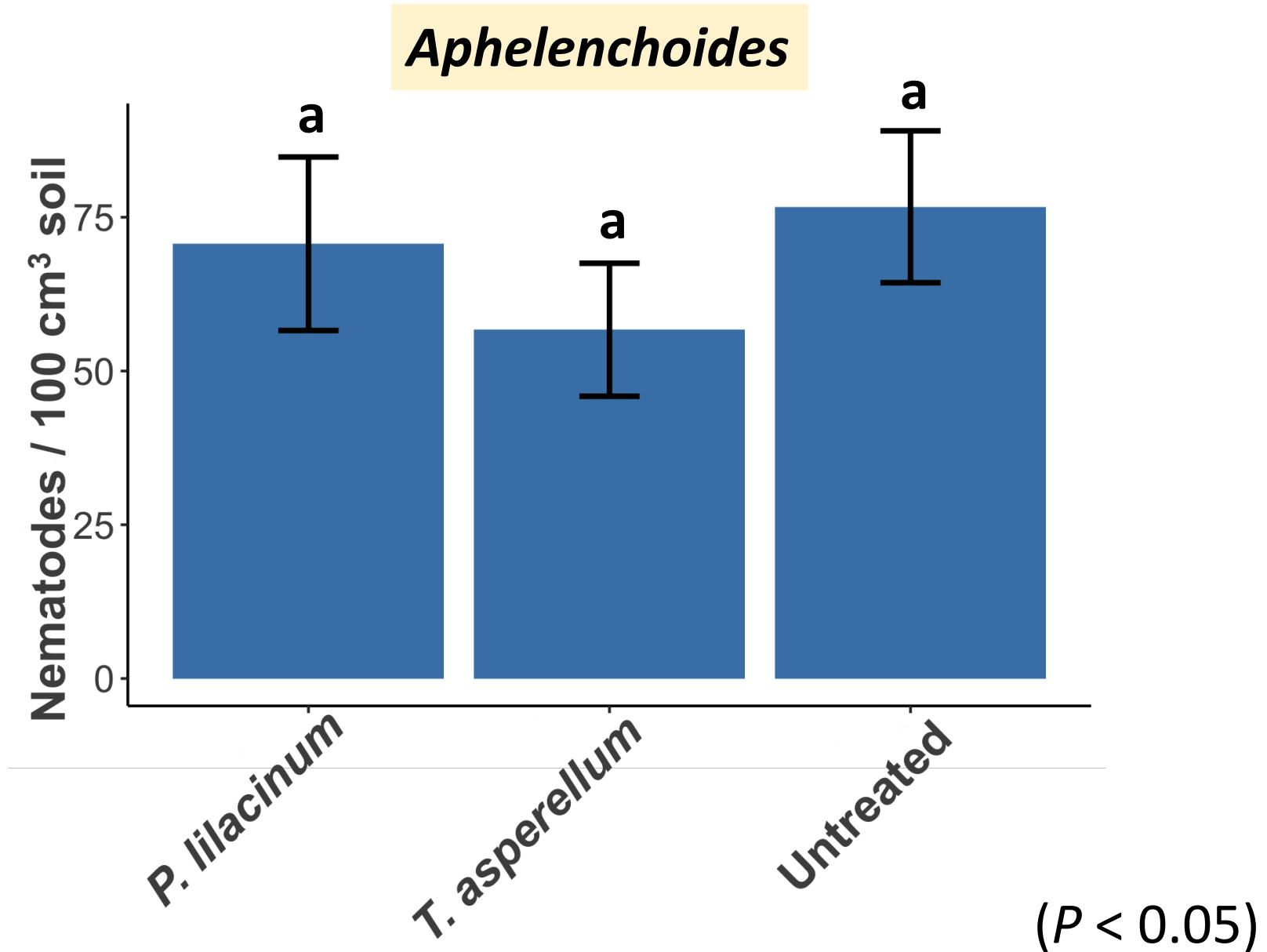
More fungivores with *P. lilacinum*.



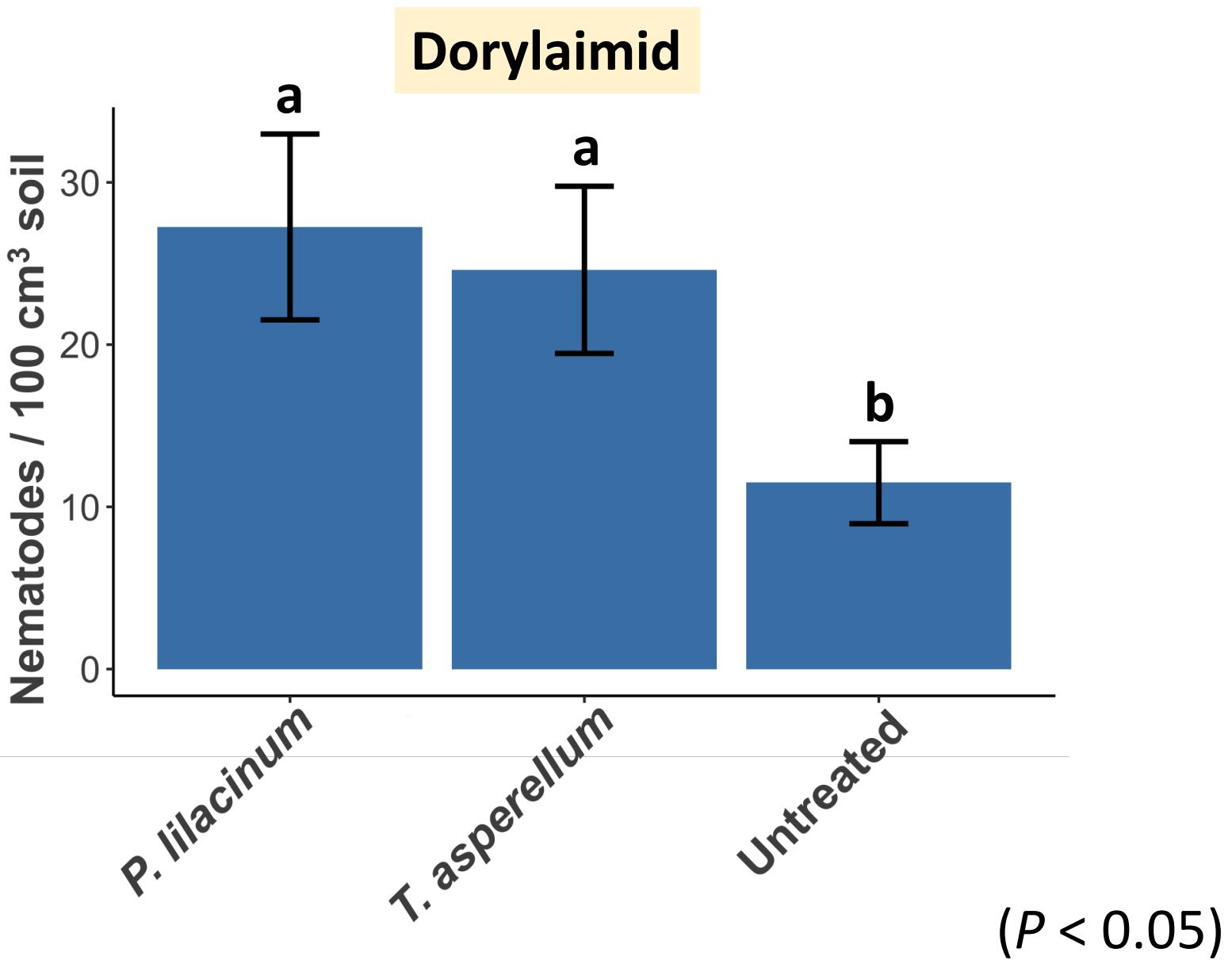
Greater number of *Aphelenchus* for *P. lilacinum*.



But *Aphelenchoides* was not affected by bioagents.



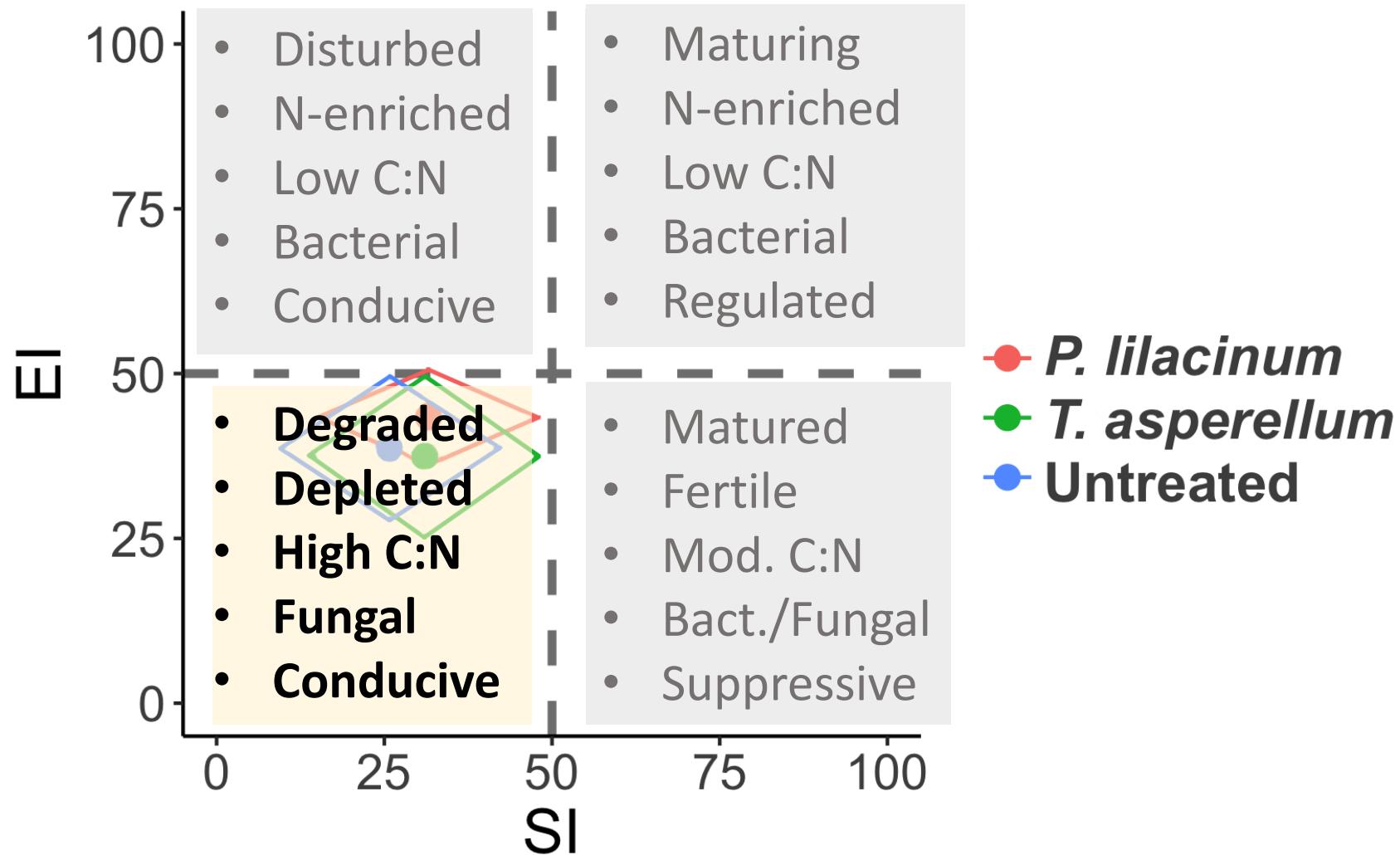
More Dorylaimid with both bioagents.



Some positive changes with bioagents on soil health conditions.

	P-value	<i>P. lilacinum</i>	<i>T. asperellum</i>	
Maturity Index	0.23	-	-	Less stressed environment for both bioagents.
Maturity Index 2-5	0.06	↑	↑	
Channel Index	0.99	-	-	
Enrichment Index	0.06	↑	→	N-enriched for <i>P. lilacinus</i> .
Structure Index	0.06	↑	↑	More fertile and stable for both bioagents.

Functional metabolic footprints of nematodes showed no difference by treatments.



Our study demonstrates both bioagents

1. Suppress RKN,
2. Positively impact soil health.



Acknowledgement

- Celestine Oduori
- Situma Wanjala
- Simon Njoroge

- Dr. Danny Coyne
- Ruth Murunde
- Boyce Harries

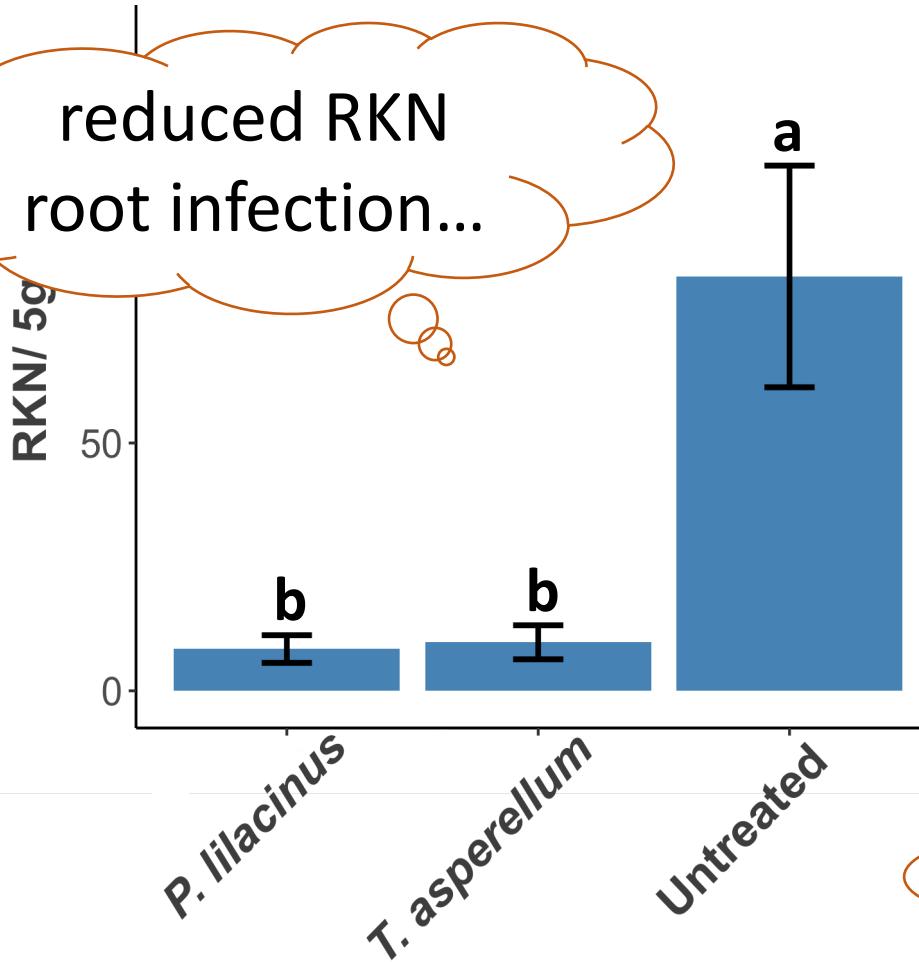


JSPS



Thank you! Any questions?

Drenching of
bioagents...



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<http://nemaplex.ucdavis.edu>

with some positive
effects in soil health!