

# Nematodes as multitrophic organisms: the good, the bad and the unexpected

Keith G Davies<sup>1,2</sup> and Sharad Mohan<sup>1,3</sup>

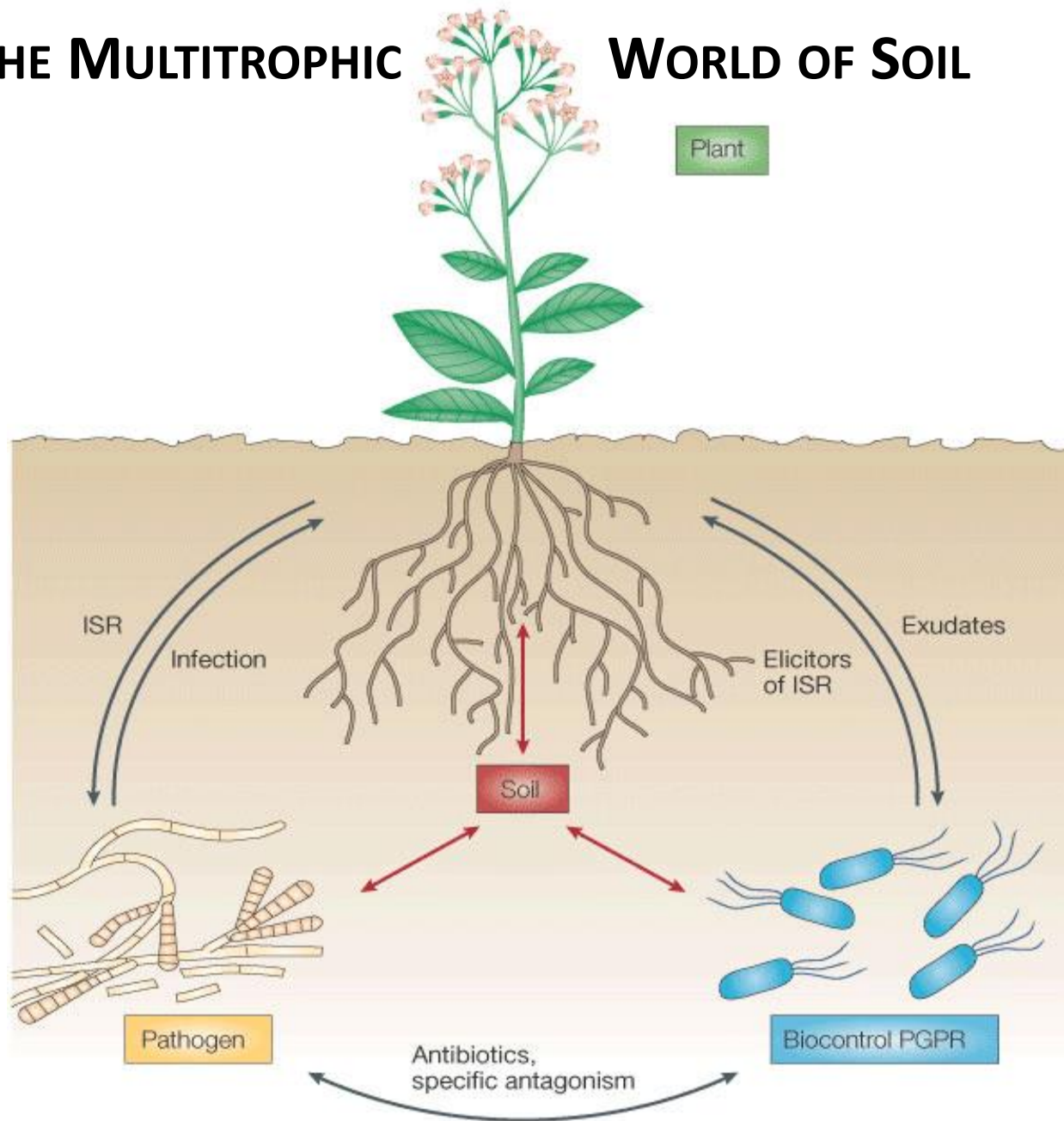
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<sup>3</sup>Indian Agricultural Research Institute, New Delhi, India



# THE MULTITROPHIC WORLD OF SOIL



# THE GOOD & THE BAD

## The Bad Guys

Root herbivores

Microbial plant pathogens

## Examples

White grubs; Nematodes

Rhizoctonia; Pythium

## The Good Guys

Pathogens/predators of root herbivores

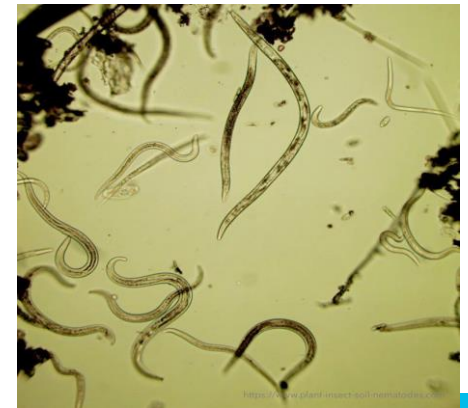
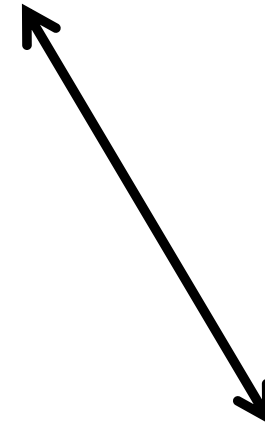
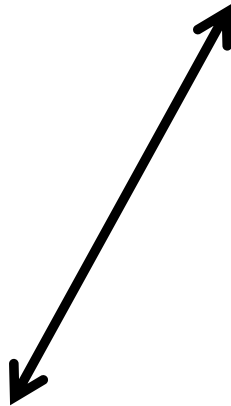
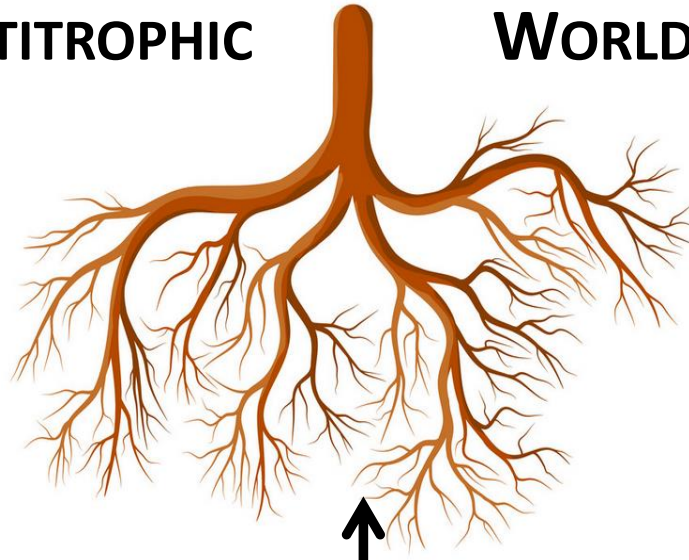
Antagonists of pathogen pathogens

Metarhizium; Nematodes

Trichoderma; Rhizobacteria

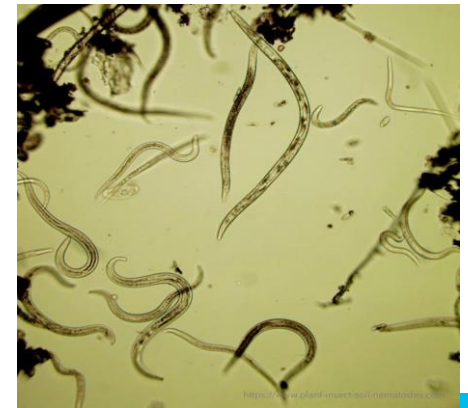
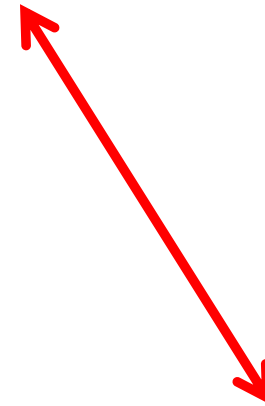
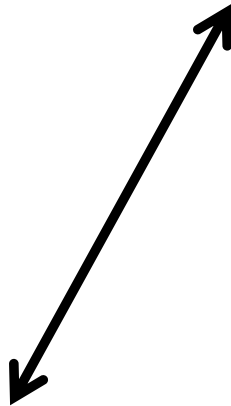
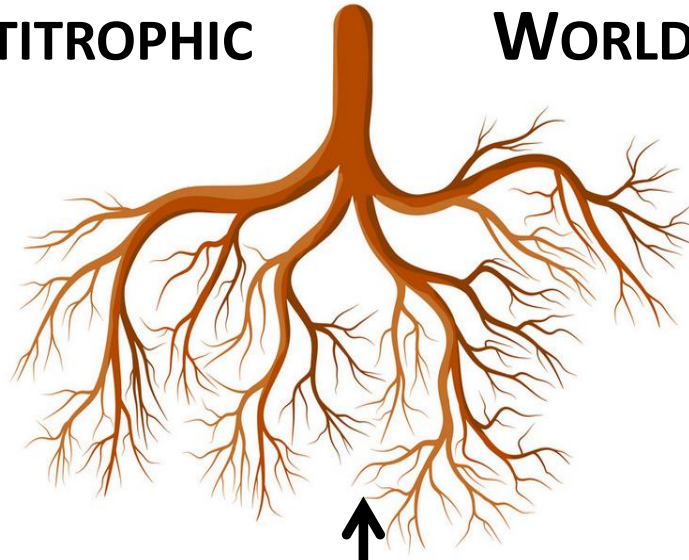
# THE MULTITROPHIC

# WORLD OF SOIL



# THE MULTITROPHIC

# WORLD OF SOIL



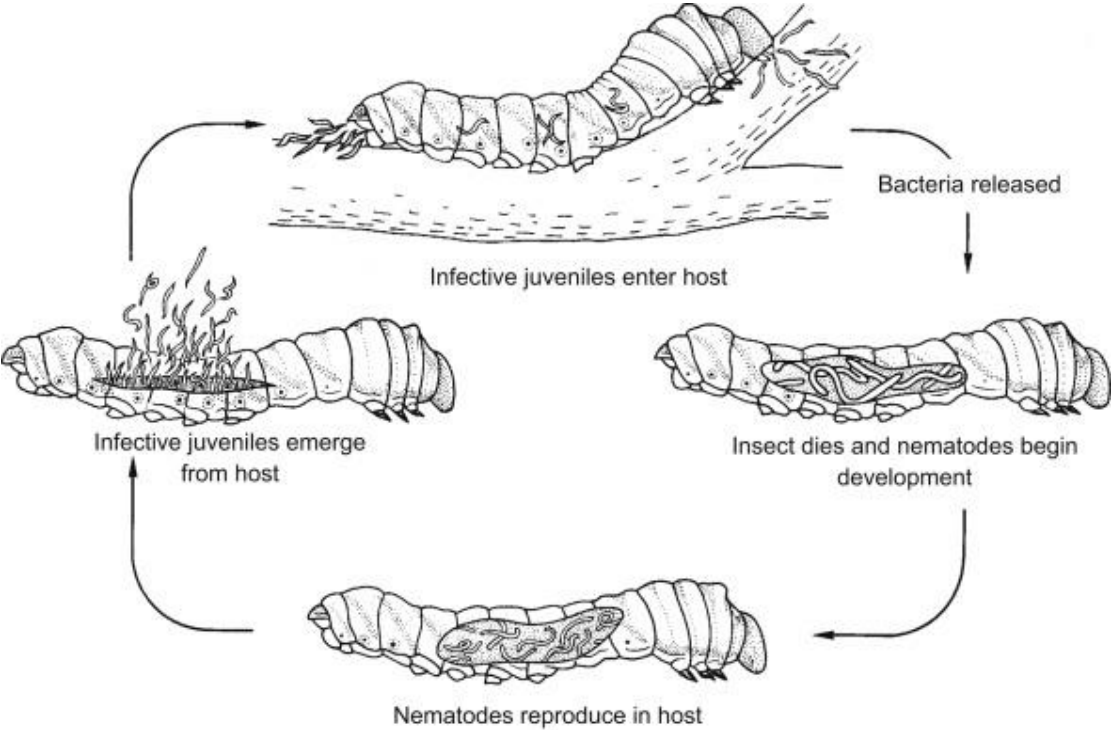
# PRODUCTION OF EPNS



White trap production of EPNs



Production of EPNs by fermentation

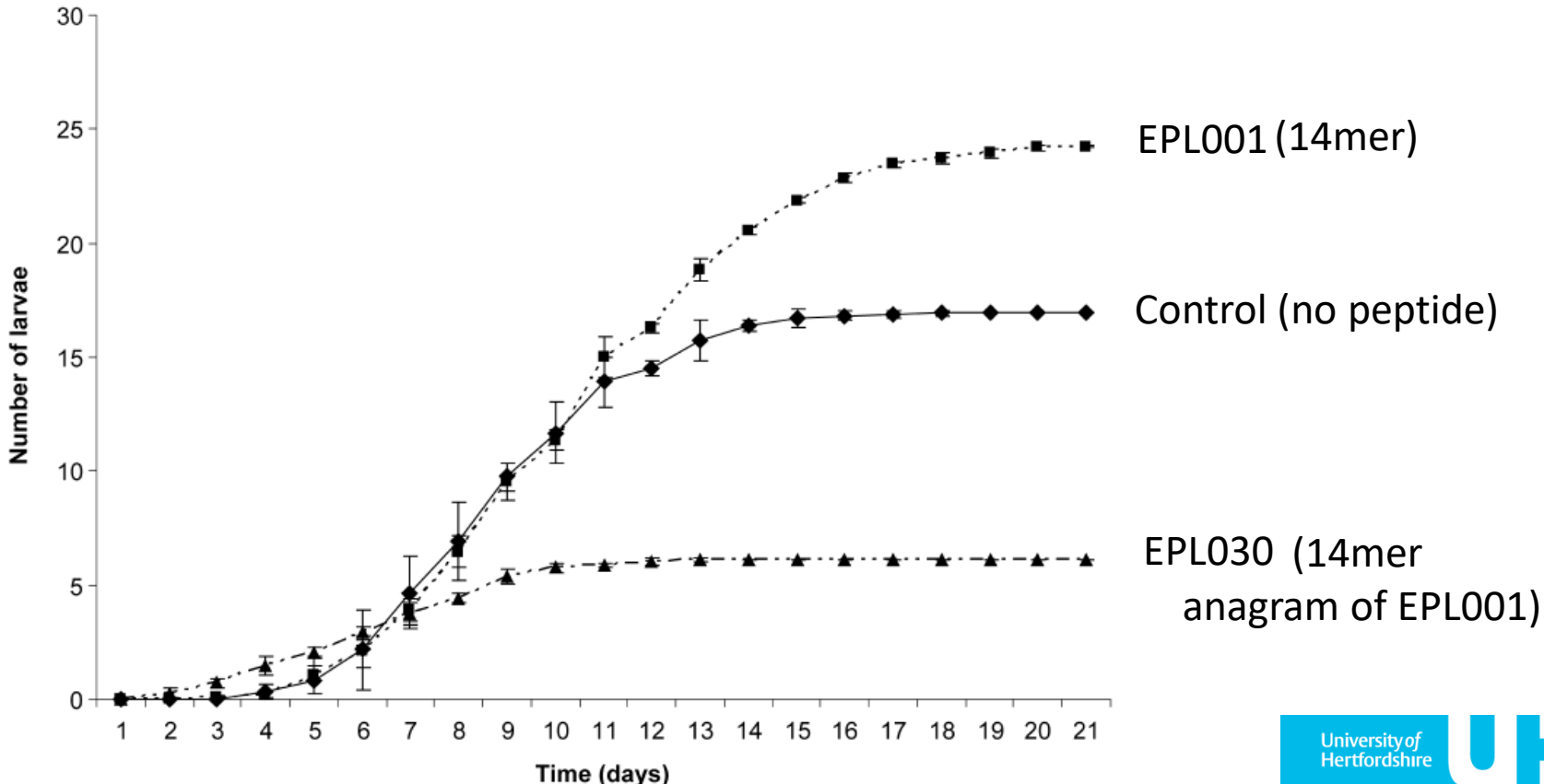


# Fecundity and lifespan manipulations in *Caenorhabditis elegans* using exogenous peptides

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<sup>1</sup> Department of Plant Pathology and Microbiology, Rothamsted Research, Harpenden, Herts AL5 2JQ, UK

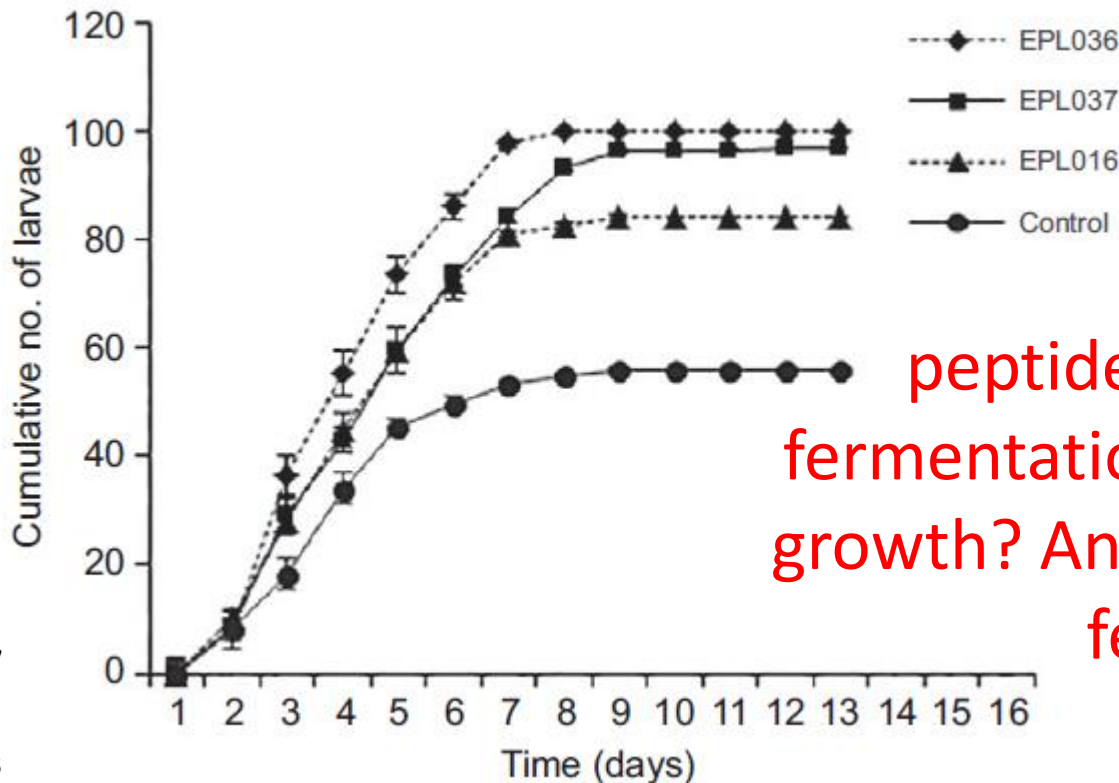
<sup>2</sup> Endocrine Pharmaceuticals, Wilderness End, Tadley Common Road, Tadley, Hants RG26 3TA, UK



RESEARCH ARTICLE

# Reproduction potentiated in nematodes (*Caenorhabditis elegans*) and guppy fish (*Poecilia reticulata*) by adding a synthetic peptide to their aqueous environment

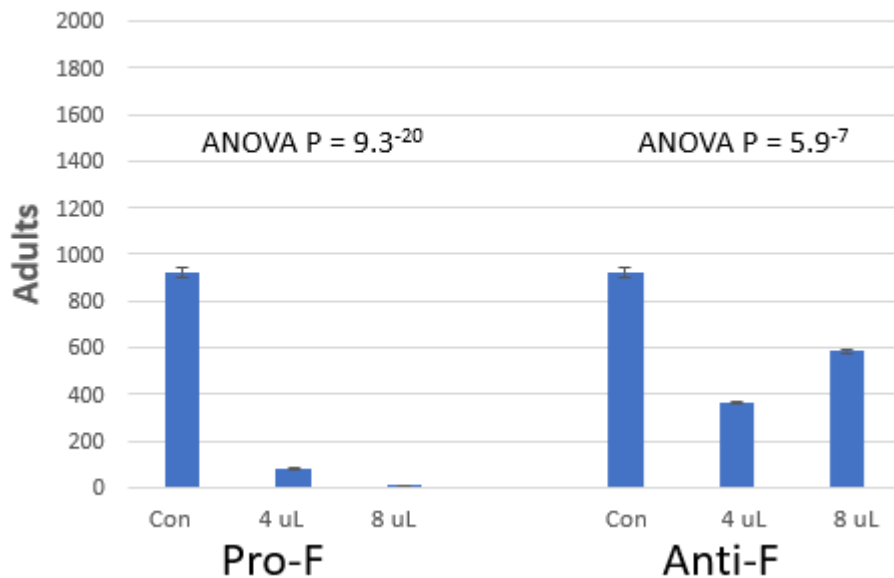
Keith G. Davies<sup>1,\*</sup>, Brian Zimmerman<sup>2</sup>, Ed Dudley<sup>3</sup>, Russell P. Newton<sup>3</sup> and John E. Hart<sup>4</sup>



Can pro-fecundity peptides be used in liquid fermentation to promote EPN growth? And what about anti-fecundity peptides?

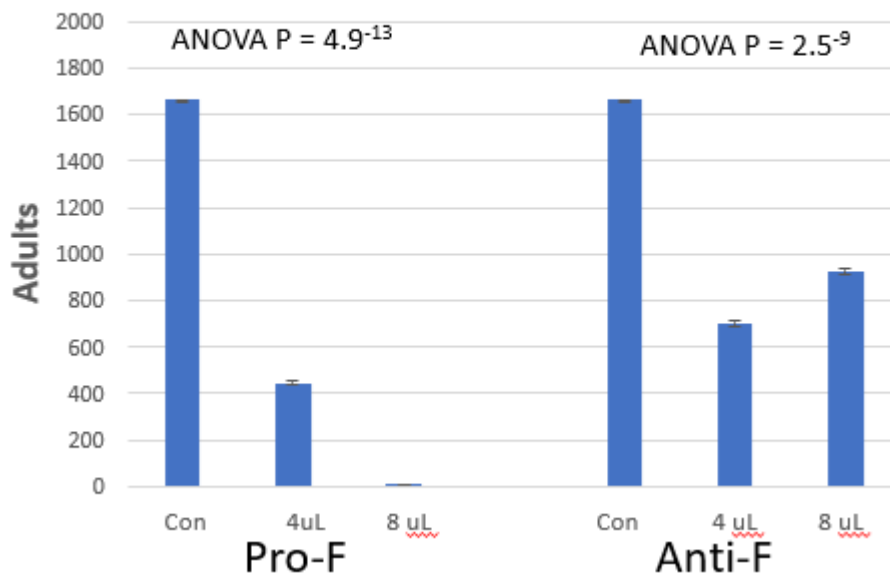


## 500 Infective juveniles



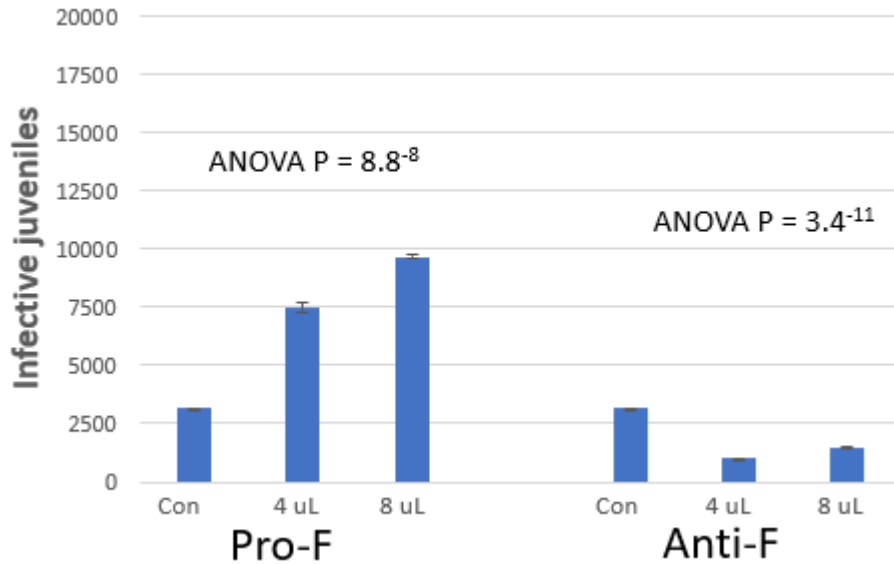
The treated adults are reduced in each treatment compared to controls

## 1000 Infective juveniles



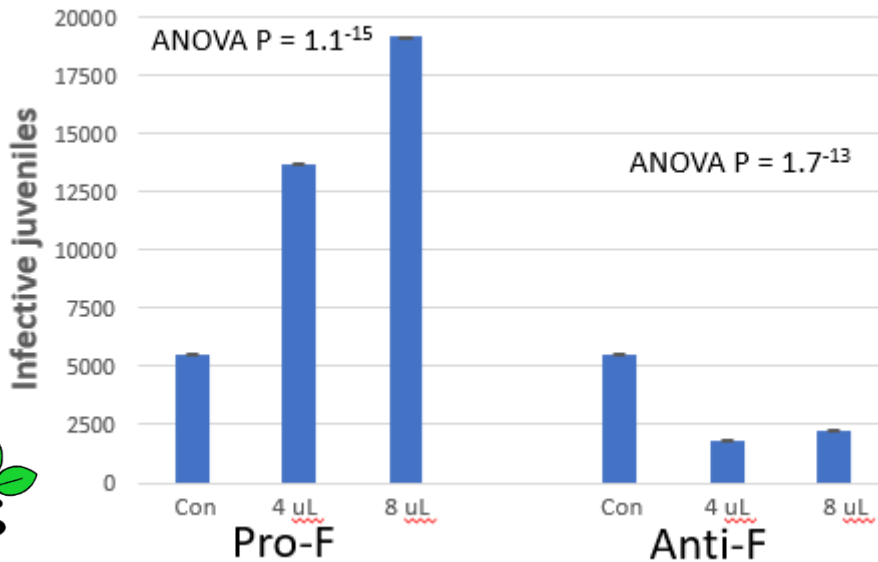
Treatments are concentration dependent

## 500 Infected juveniles



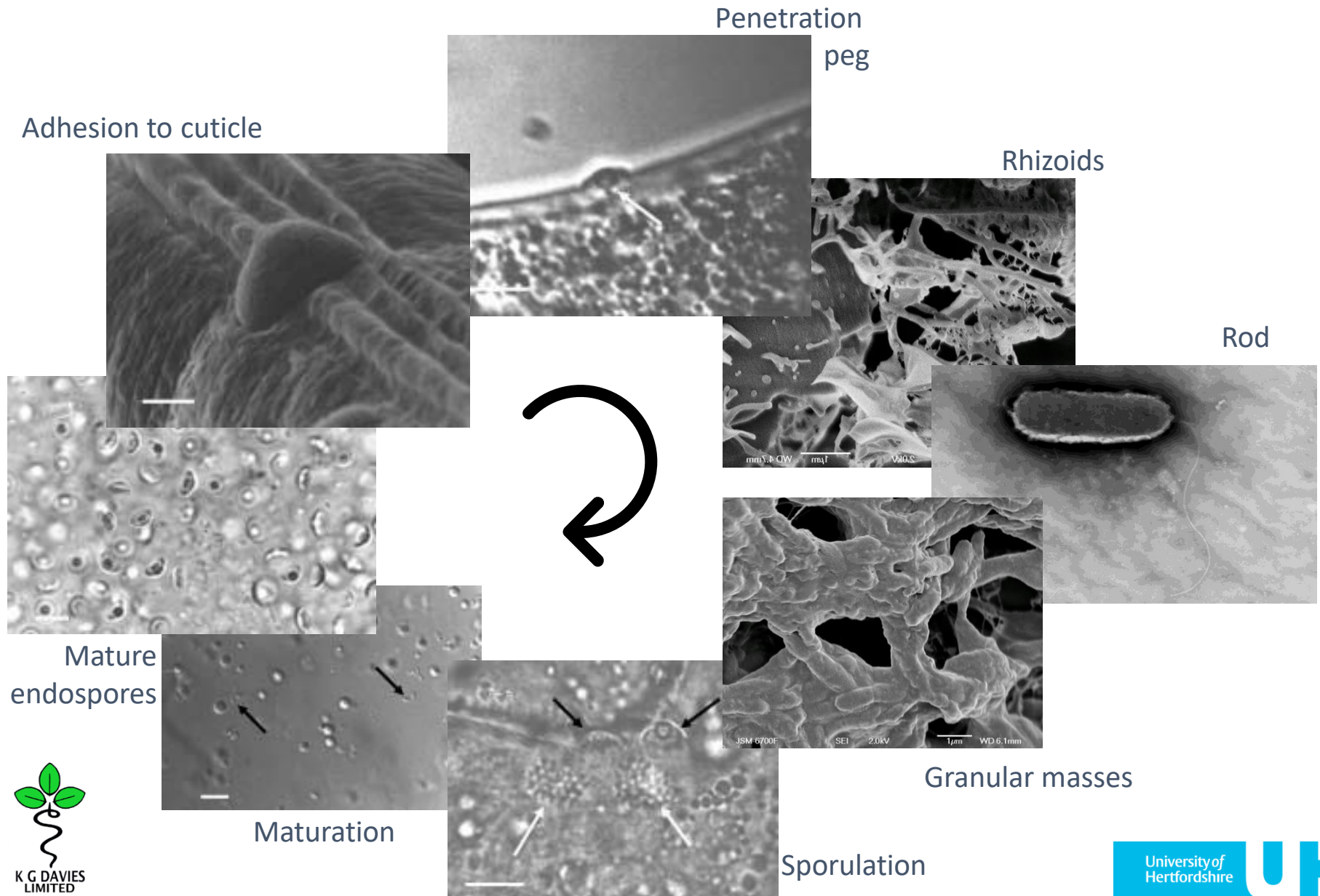
Treated infected juveniles are increased in a concentration dependent manner with Pro-F peptide

## 1000 Infected juveniles

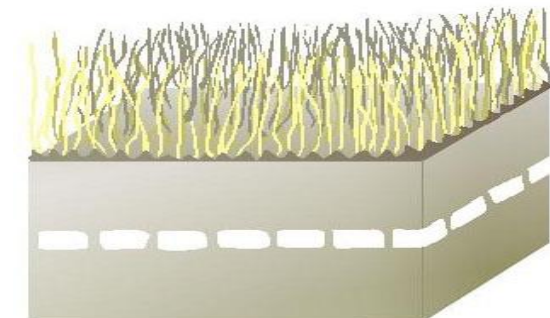
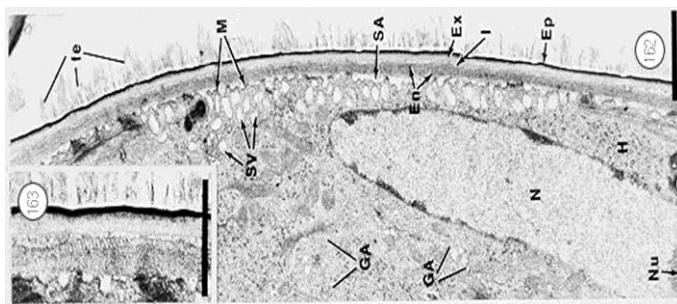
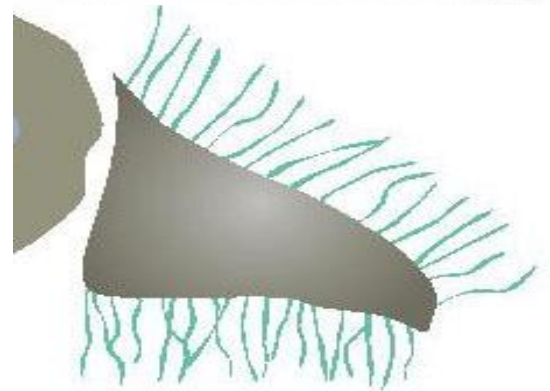
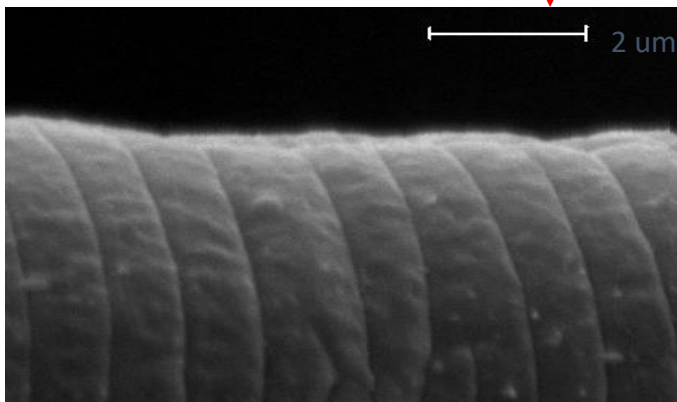
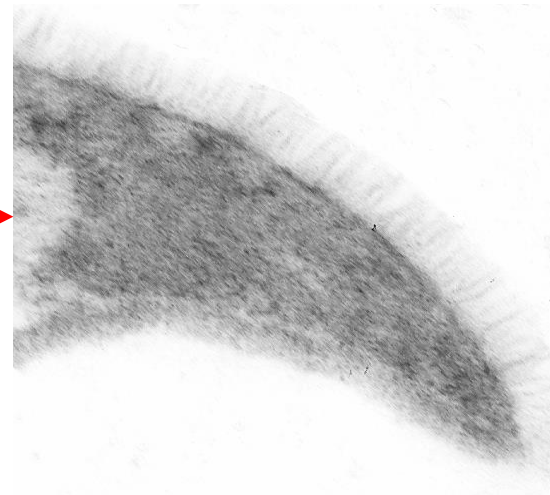


Anti-F peptide reduces fecundity of infective juveniles

# Re-evaluation of the life-cycle of *Pasteuria penetrans*: on root-knot Nematodes (Davies *et al.*, Nematology 2011)



# Spore attachment: *Velcro*-like mechanism



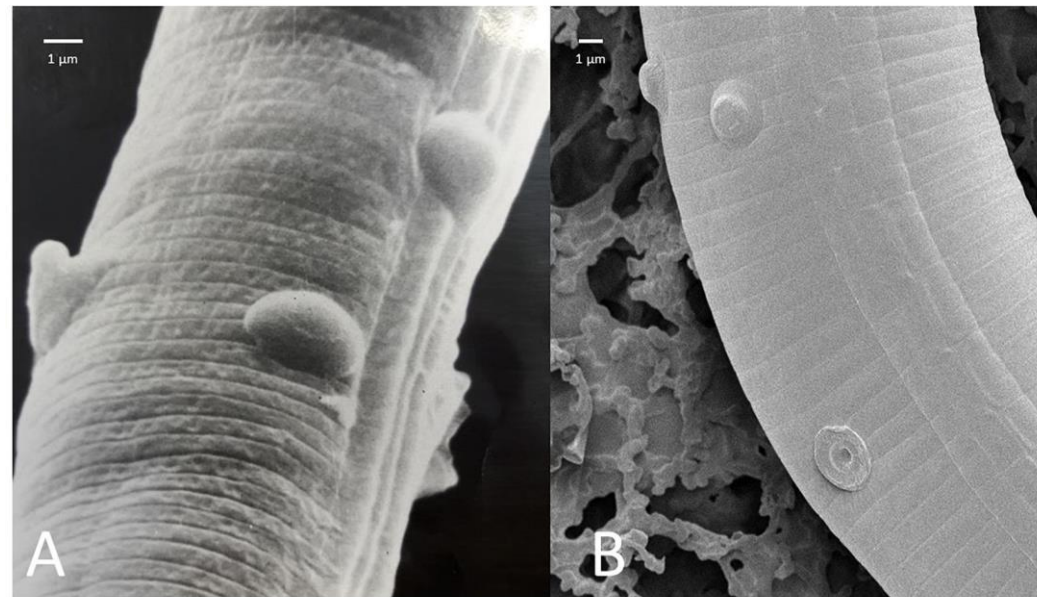


# Plant Root-Exudates Recruit Hyperparasitic Bacteria of Phytonematodes by Altered Cuticle Aging: Implications for Biological Control Strategies

Sharad Mohan, K. Kiran Kumar, Vivek Sutar, Supradip Saha, Janet Rowe and Keith G. Davies

*Meloidogyne incognita*

*Heterodera cajani*

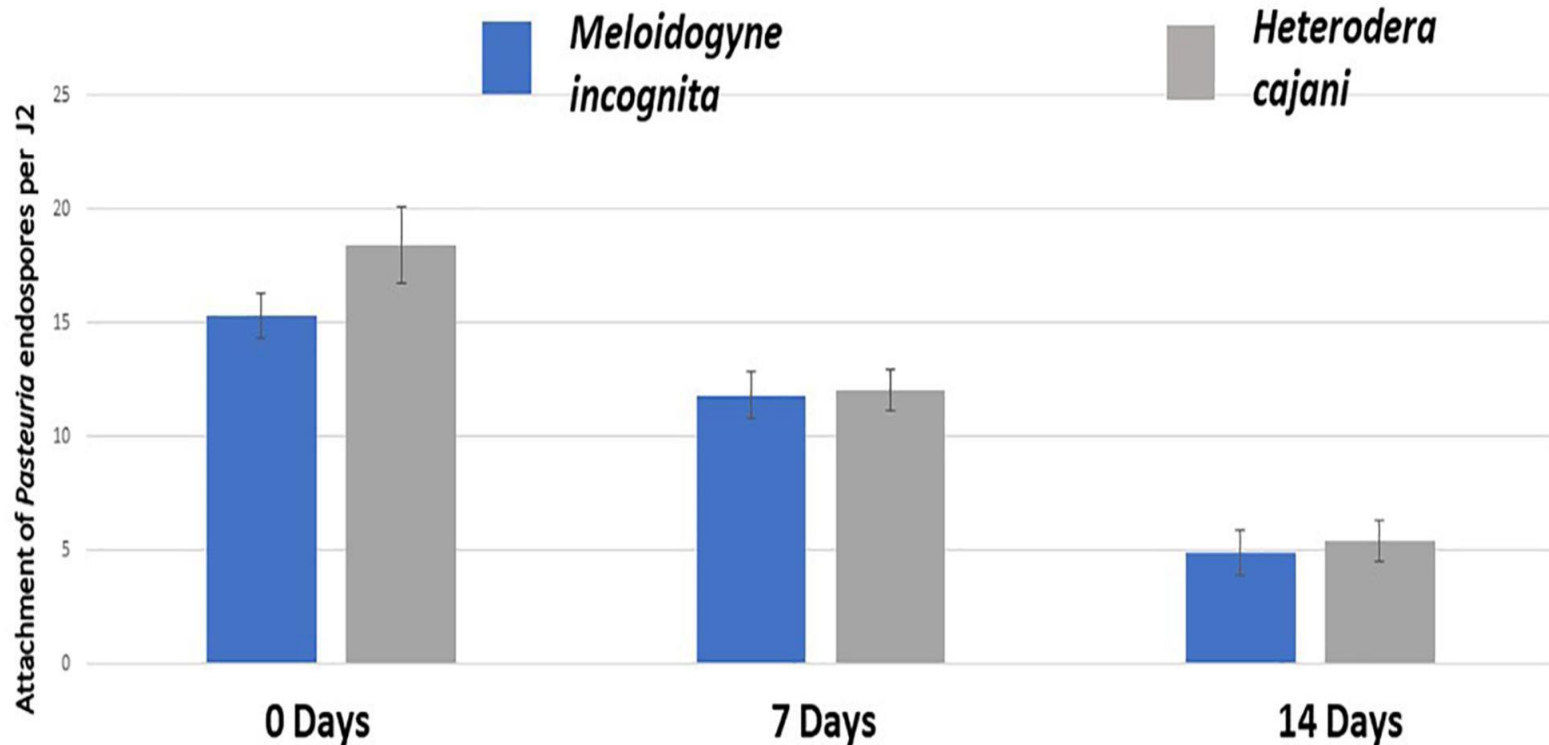


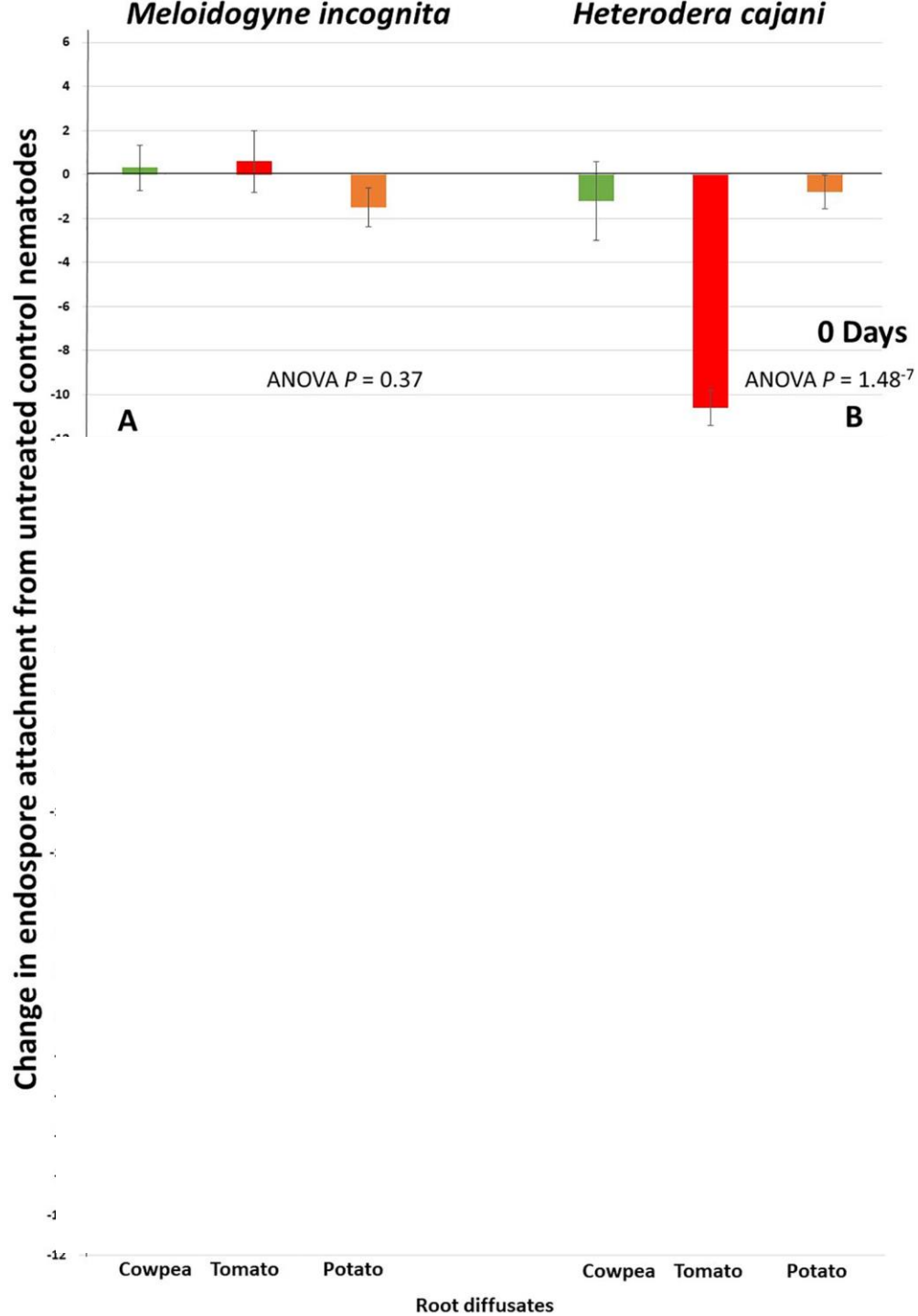
C Crop host status	Root-knot nematode (RKN)	Cyst nematode (HC)
Cowpea	+	++
Tomato	++	-
Potato	+	-

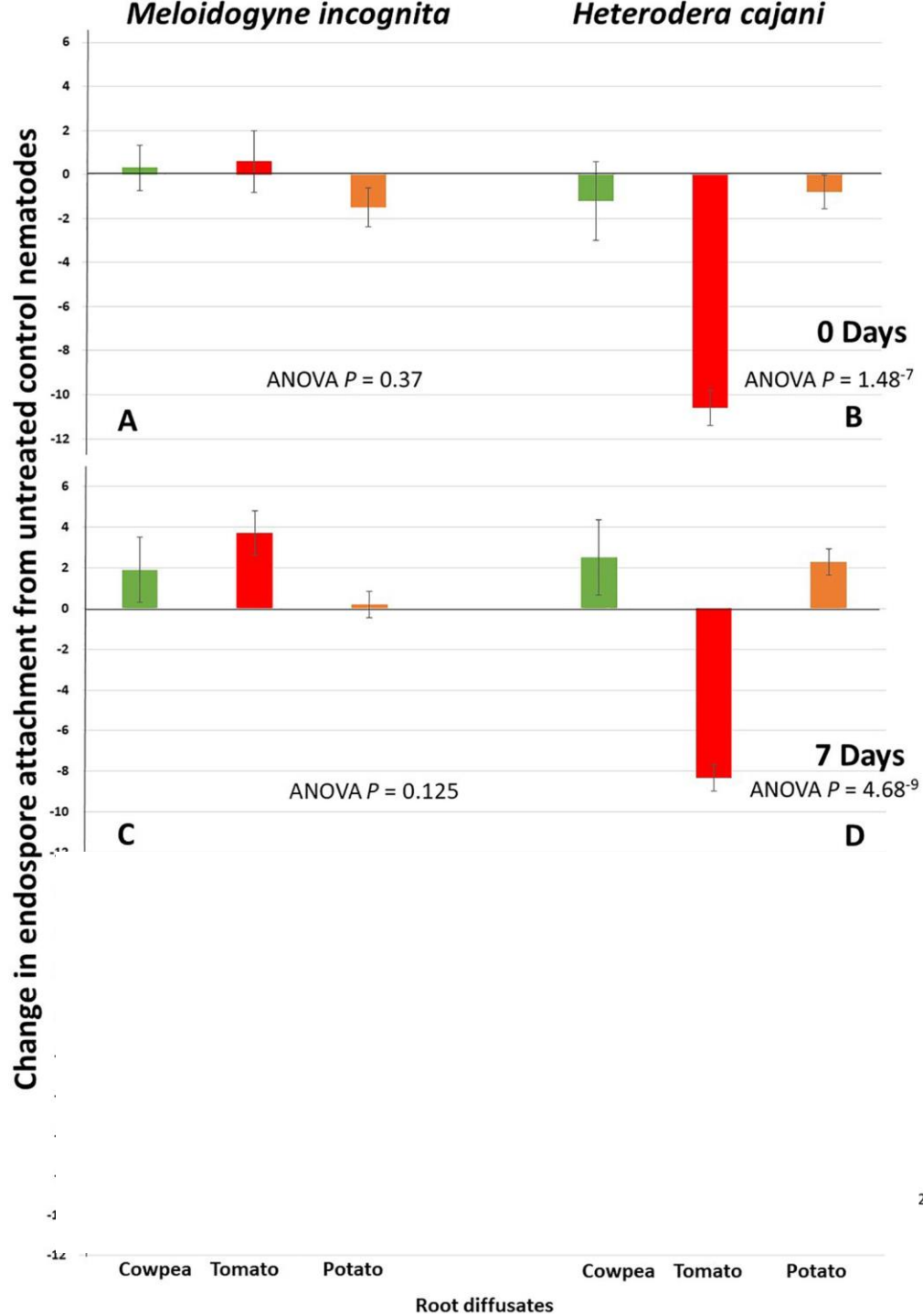


# Plant Root-Exudates Recruit Hyperparasitic Bacteria of Phytonematodes by Altered Cuticle Aging: Implications for Biological Control Strategies

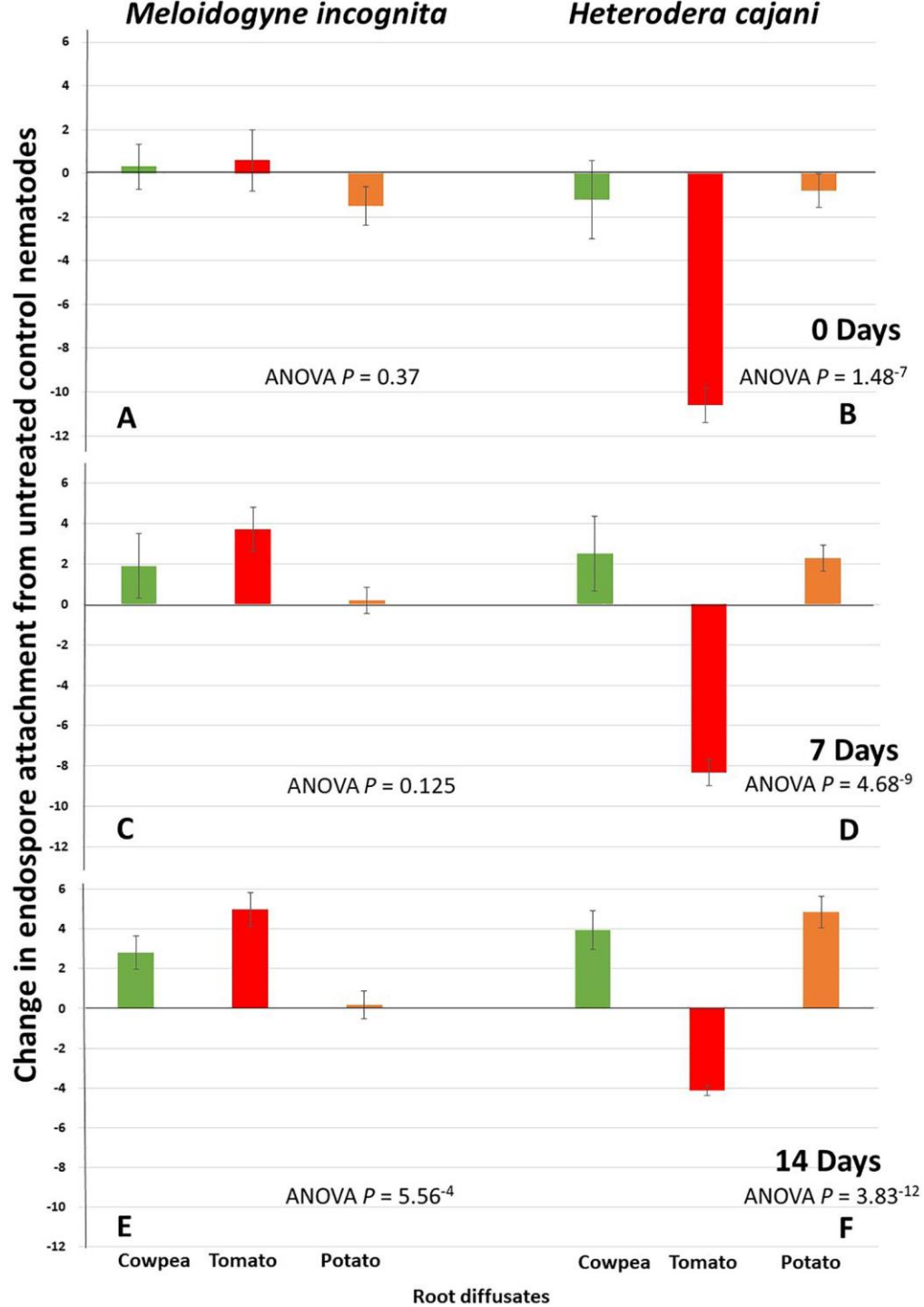
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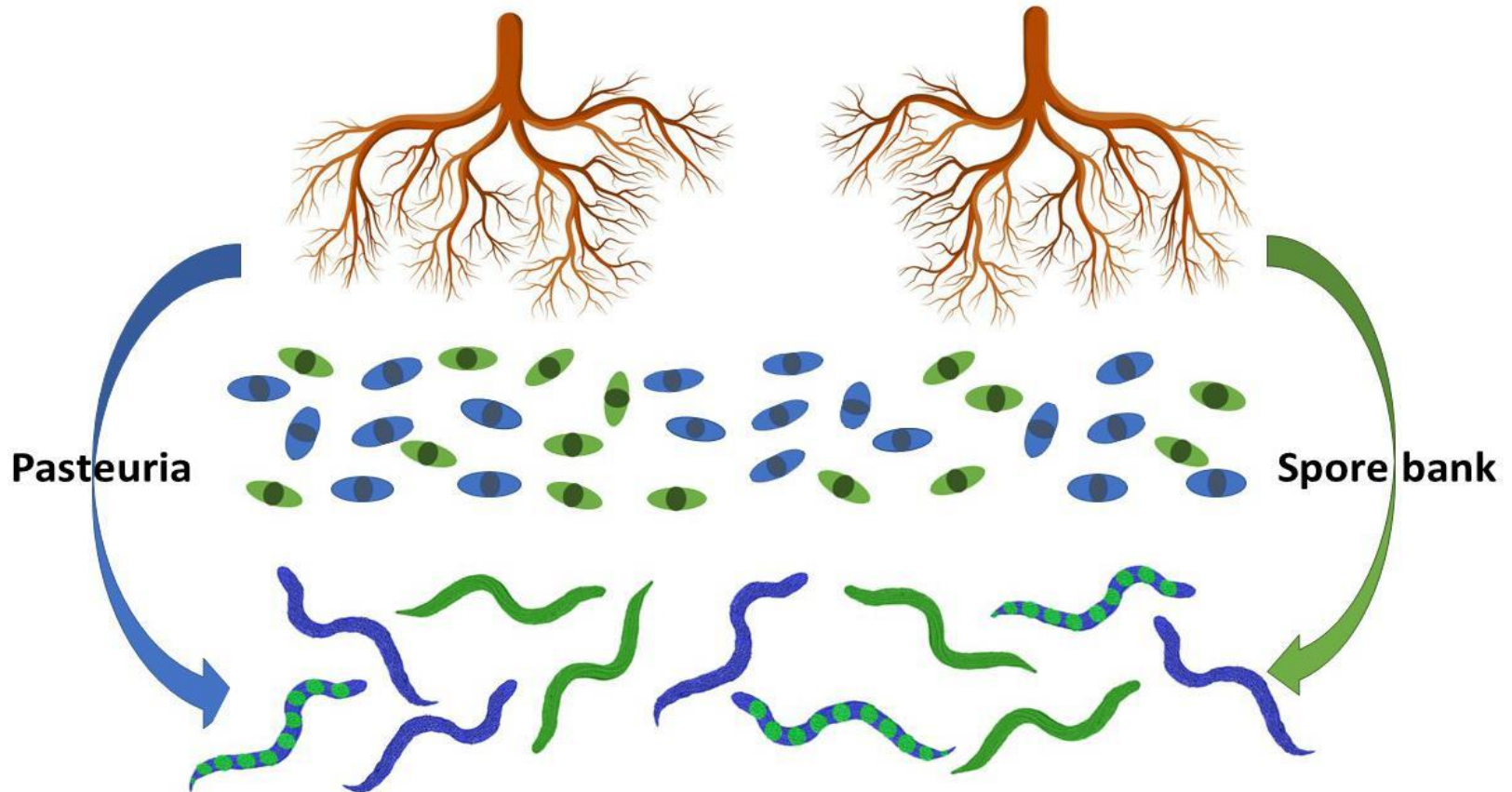




# Plants

Host A blue  
nematodes

Host B green  
nematodes



**Mixed nematode populations (x3):**  
green nematodes pick up green *Pasteuria* spores;  
blue nematodes pick up blue *Pasteuria* spores  
green/blue stripped nematodes pick up both spores

# Lessons of the Unexpected!

Serendipity can be surprisingly informative

“Forget the grammar and blurt it out”

*Paraphrasing Ernest Hemingway  
when asked about speaking French;  
the scientific equivalent of:*

Forget the theory and do the experiment

“In the fields of observation chance favours only  
the prepared mind”

*Louis Pasteur*



**Endocrine Pharmaceuticals**



University of  
Hertfordshire

