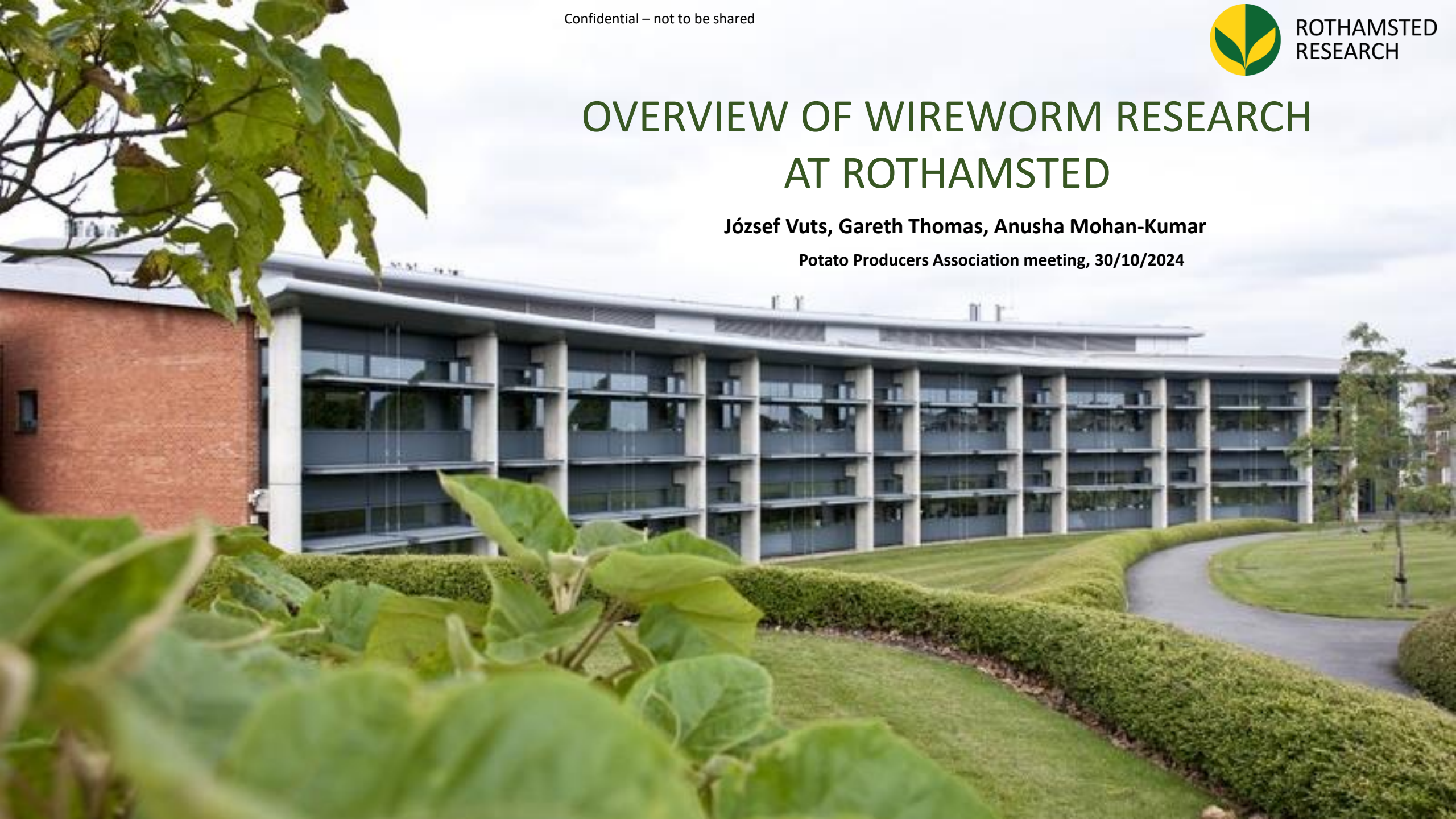


OVERVIEW OF WIREWORM RESEARCH AT ROTHAMSTED

József Vuts, Gareth Thomas, Anusha Mohan-Kumar

Potato Producers Association meeting, 30/10/2024



THE CHALLENGE: Enhancing the environment whilst safeguarding future food production

£128B p.a. global food production losses caused by pests and diseases (£4B UK)

Global challenges for agriculture:

- climate change
- fast-growing population
- limited land and resources
- regulatory pressures
- societal demands
- biodiversity decline
- greenhouse gas emissions
- financial sustainability

Future food production 'musts':

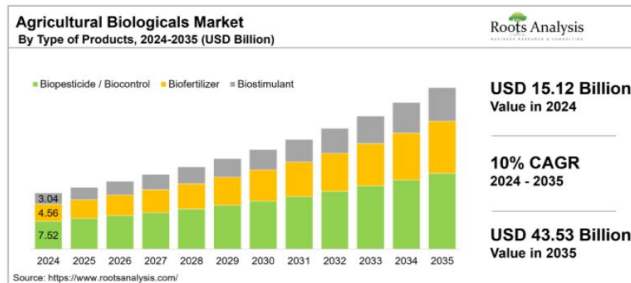
- meet high quality standards
- reduce waste and on-carbon emissions
- be less resource-intensive
- support biodiversity



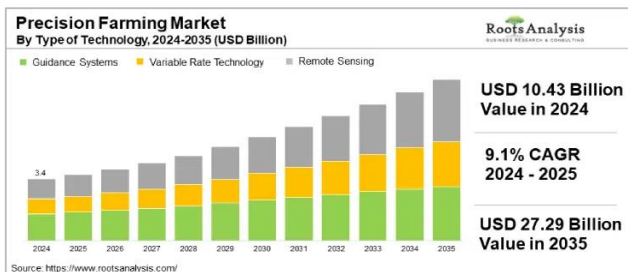
THE DEMAND: Biodiversity-enhancing pest* management solutions

Biologicals, tools and traits to enhance crop health

Global agricultural **biologicals** market to increase from \$15.1B (2024) to \$43.5B (2035) – CAGR 10%



Global **precision agriculture** market to increase from \$10.4B (2024) to \$27.3B (2035) – CAGPR 9.1%



Global crop **genetic/breeding** traits market to increase from \$13.6B (2023) to \$36.1B (2030) – CAGR 14.9%

10 Years from now, today's crop protection pesticides will be replaced by nature-inspired approaches, specific and effective to their target, benefiting wider biodiversity and society with reduced environmental impact

Rothamsted Research is leading the way in the transition towards Regenerative Agriculture farming practices by innovating nature-inspired solutions for crop protection

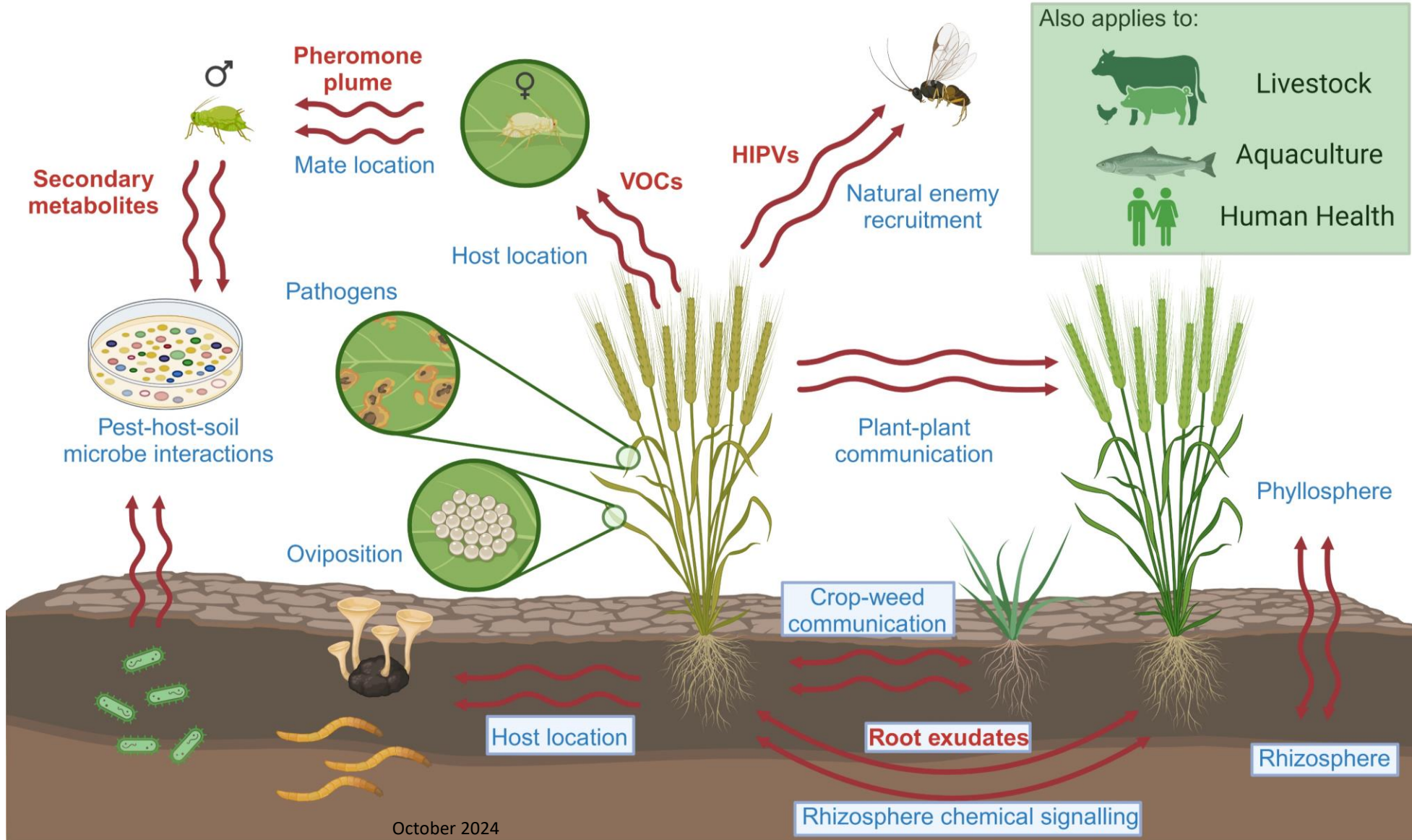
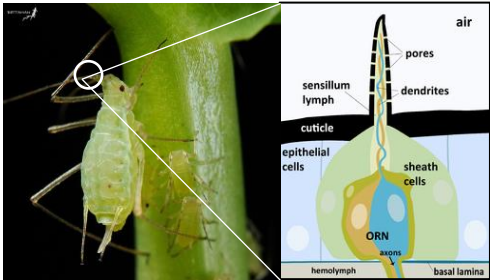
Key drivers for nature-based solutions:

- *Low toxicity*
- *Species-specific*
- *Biodiversity-enhancing*

*Insects (including disease vectors), pathogens and weeds

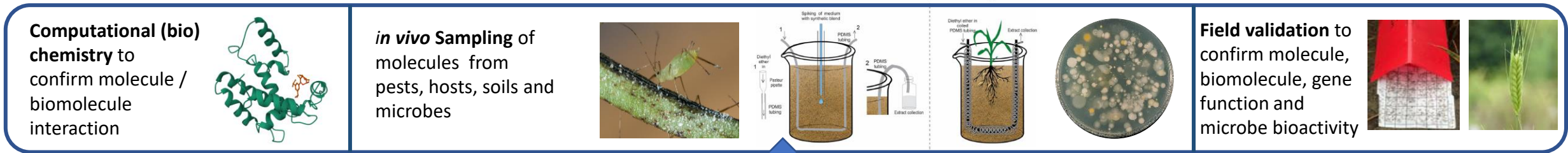
THE SCIENCE: bioscience R&D underpinning innovation

Discovery of **molecules, biomolecules, functional genes and microbes** from nature that govern crop - pest ecological interactions



THE SCIENCE: bioscience R&D underpinning innovation

Unique, multidisciplinary expertise with 'gene-to-field' R & D capability



Bioassay testing – antennal electrophysiology, behaviour, development



Analytical Chemistry



GC, GC-MS, LC-MS, SFC-MS analysis

Biomolecular NMR spectroscopy

A unique UK capability operational end 2024



Biomolecular (700 MHz) NMR, with BioSolids probe

RRes Connectivity:

- functional genomics
- next generation IPM
- agroecology
- soil microbiology
- bioinformatics
- agroecosystems modelling
- RIS & entomology
- REL tenants
- UKRI community
- International R & D

RRes Capability:

- Infrastructure
 - synthetic chemistry lab
 - insectary
 - glasshouses
 - controlled environment
 - farm platform
- Scientific services
 - genomics, bioinformatics, statistics and data science, research data systems

CHEMICAL ECOLOGY SCIENTIFIC SERVICE
TAXPAYER-FUNDED INVESTMENT > £4.2M since 2021

SCIENCE TEAM: > 50 years combined bioscience R&D expertise



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Rothamsted Chemical Ecology group:
PDRAs, PhD Students and Technicians

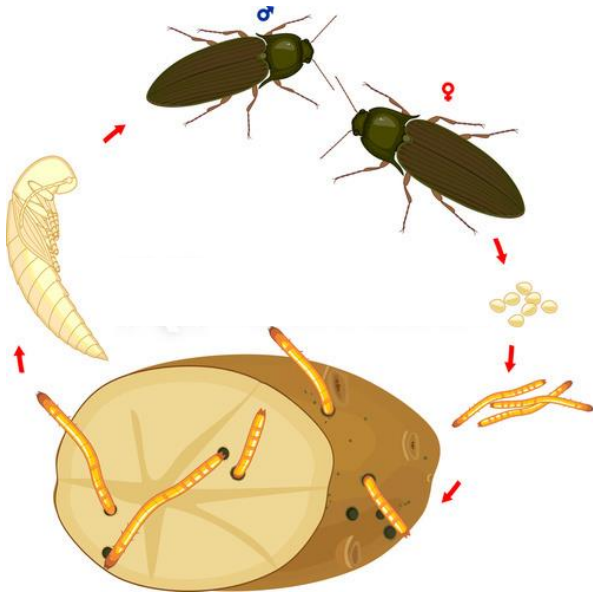
Soil-dwelling pest insects cause significant crop damage

- Their control becomes more difficult due to the increasing ban on soil insecticides
- Alternative, environmentally benign ways of pest management are needed that rely on detection, monitoring, forecast and resistance traits
- Semiochemicals (naturally occurring, behaviour- and development-modifying compounds) can offer feasible targets for pest management and crop stress tolerance



Key soil pest highlight: wireworms

- Soil-dwelling larvae of click beetles (Coleoptera: Elateridae), which consume a range of crops, including potatoes, wheat, root vegetables and maize
- Integrated Pest Management (IPM) approaches are needed that rely on larval monitoring and damage forecast
- Soil traps formulated using attractive, plant-derived semiochemicals can offer more precise prediction of local populations



Wireworm life cycle

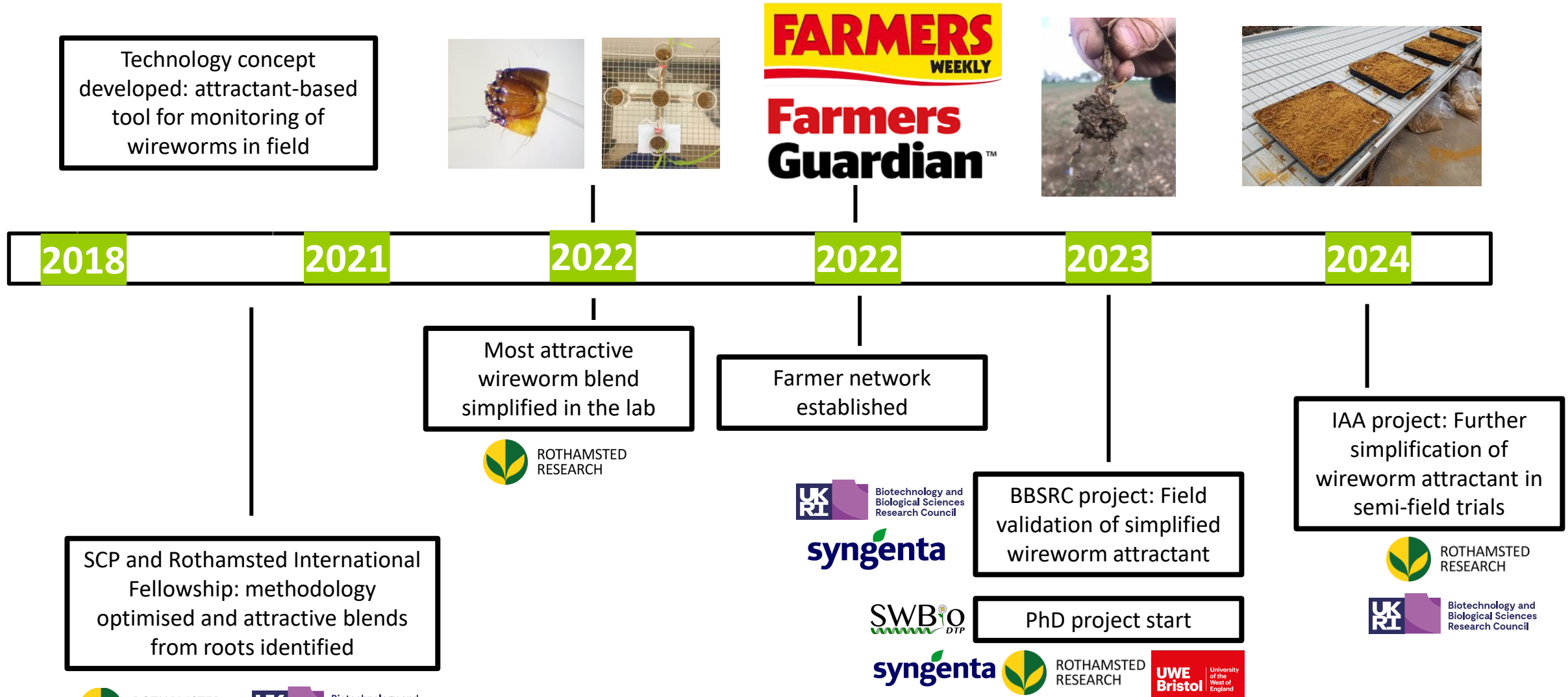


Wireworm-damaged maize roots



Wireworm-damaged wheat field

TIMELINE: Development of attractant tools for wireworm monitoring



Training of the next generation of research scientists

PhD studentship 2022-2026:

Semiochemical-based alternative concepts for the management of wireworms



Behavioural responses of wireworms in four-arm soil olfactometer bioassays to different varieties of wheat (*Triticum aestivum*)



PhD studentship 2025-2029

PhD studentship proposal submitted to look at effects of crop rotation and cover crops on wireworm damage to potato



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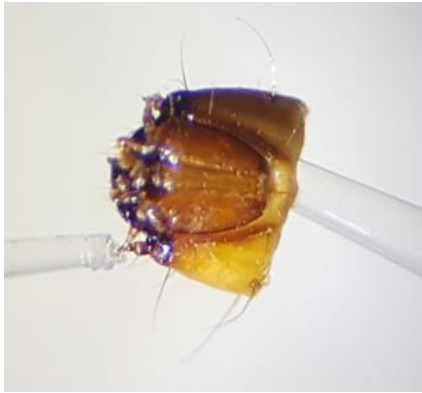
Identifying wireworm attractants: From lab to field



Soil olfactometer bioassay



Identify odours from plant roots



Larval electrophysiology



Soil olfactometer bioassay (Blend of odours in the form of chemicals, instead of plants)



Larger scale tests (semi-field), using sand trays with attractive odours



Field testing with attractive odour blend

Output: Semiochemical-based attractant for wireworm monitoring and management

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New research project needs farmers' wireworms

Guy Peckett
17 July 2024

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- Arable
- Crop management
- Pest management

Recommended



Updated advice on tackling

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Growers are being asked to send live wireworms to Rothamsted Research, where researchers are developing tools to help farmers accurately assess wireworm soil numbers.

ADVERTORIAL

**Got wireworm damage on your farm?
Rothamsted scientists need your help!**

New research project needs samples to test whether plant smells can help with control of this pernicious pest

Wireworms are major pests of cereal crops and root vegetables. Seed treatments and other contact insecticides are used to protect crops from larval feeding damage, but these are being phased out in Europe, and it is very questionable when and if at all a new soil insecticide could be registered for wireworm management.

Please contact us to arrange a site visit, or to send us wireworms