



第253回 物質循環談話会

2026年10月20日(火) 13:30-15:30

13番教室 (理学部C棟1階)

SPEAKER 2: Dr. Juan Taboadela Hernanz

(Faculty of Science, Shinshu University／助教)



TOPIC: Sustainable Use of Natural Resources in Agricultural Landscapes: Use of Plant-Associated Beneficial Microbes to Improve Crop Yield and Resilience

The growing global population is increasing the demand for food, while agricultural production faces increasing pressures from limited resources, environmental degradation, and climate change. Chemical fertilizers and pesticides have played an important role in sustaining crop productivity, but their intensive use has also raised concerns about water pollution and eutrophication, soil degradation, appearance of resistant pathogen strains and impacts on non-target organisms and biodiversity. These challenges highlight the need for agricultural practices that can maintain crop production while reducing reliance on chemical inputs. In the EU, pesticide use and risk are targeted to decrease by 50% by 2030, while Japan targets a 50% reduction in risk-weighted pesticide use and a 30% reduction in chemical fertilizer use by 2050. In recent years the use of plant-associated microorganisms has shown promising results in promoting plant growth, nutrient availability, stress tolerance, and disease suppression, offering an additional means of improving crop resilience.

This seminar will discuss the potential and limitations of plant-associated microorganisms as a tool for sustainable agriculture. A case study using rhizosphere bacteria to promote plant growth and suppress disease in soybean will be presented, followed by an overview of plant-microorganism communication and current approaches to establish beneficial soil microbial communities. Together, these approaches highlight the potential of plant-microorganism interactions to reduce chemical inputs and promote more resilient and sustainable agroecosystems.



Fig 1

Soybean plant from Toyama Research Institute experimental field affected by stem and root rot disease caused by the pathogen *Phytophthora sojae*. Even though the use of chemical pesticides is a common practise (blue coating in root) disease occurs due to excessive pathogen population pressure and subsequence appearance of resistant strains.



Fig 2

Comparison of plant growth after 4 weeks between soybean plants inoculated with the beneficial rhizobacterium *Enterobacter pseudoroggenkampii* GVv1 and non-treated soybean plants.

Keywords: Plant-microbe interactions, crop resilience, sustainable agriculture, rhizosphere ecology.

主催: 信州大学 理学部理学科 物質循環学コース

共催: 信州大学 地圏・湖沼カーボンダイナミクス研究拠点, 信州大学 山岳科学研究所,
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