KIEL PLANT CENTER

KPC MINI SYMPOSIUM

Monday 18th January 2021

15:00 – 16:15

via Zoom

Access Details:

Topic: KPC Mini Symposium
Time: Jan 18, 2021 03:00 PM Amsterdam, Berlin, Rome, Stockholm, Vienna

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15:00
Welcome
Prof. Dr. Eva Stukenbrock
Environmental Genomics Group, CAU

Chair: Dr. Jay Jethva, Post-Doc, Department of Plant Developmental Biology and Plant Physiology, CAU

15:10
Presentation of Deutsche Botanische Gesellschaft Master Thesis Award:
Levke Valena Höche, Master student, Institute for Ecosystem Research (AG Prof. Dr. Alexandra Erfmeier), CAU

Sex and origin-specific inbreeding effects on flower attractiveness to specialised pollinators

While it is well established that inbreeding in small and isolated plant populations reduces Darwinian fitness, its effects on the diverse functional traits mediating the

communication with pollinators are to date poorly understood. A reduction of floral attractiveness and the associated pollinator visitation rates following inbreeding may be particularly fatal for dioecious plants if one sex is disproportionally affected. The magnitude of such perils may vary depending on the evolutionary history of plant populations. We employ an integrated methodological approach to address these issues using the dioecious plant species *Silene latifolia* and its moth pollinators as a study system. We investigate the combined effects of experimental inbreeding, sex and population origin on pollinator visitation rates and floral attractiveness as characterized by the composition of headspace floral volatiles and spatial flower traits.

15:25: Questions

15:30

Dr. Tim Lachnit, Post doc, Department of zoology (Prof. Dr. Dr. Thomas Bosch), CAU

Environmental stress related disease and the loss of underwater seaweed forest

Seaweeds are important habitat forming organisms in the marine environment. In the last decades seaweed habitats are declining in many areas around the world. The loss of seaweed has been associated with environmental stressors, such as increased temperature and/or eutrophication. Understanding how environmental stress affect marine seaweeds it must be taken into account that seaweeds are holobionts and associated with complex microbial communities. While there is increasing knowledge about the specificity and regulation of seaweed associated bacteria other members of the microbiome have been totally disregarded. Viruses are compared to bacteria the most abundant and diverse entity in the marine environment. Sequencing the virome of the red seaweed *Delisea pulchra* and the kelp species *Ecklonia radiata* revealed the presence of a diverse viral community. Our results shed light on a so far neglected part of the seaweed holobiont, and suggest that some of the identified viruses may act as pathogens and contribute to the decline of seaweed habitats.

15.45: Question

15:50:

Prof. Dr. Sandra Spielvogel, Institute of Soil Science and Plant Nutrition, CAU

Management of hotspots for sustainable crop production: hotter, deeper, or simply more?

Hotspots in agricultural soils, which include rhizosphere, detritusphere and drilosphere, are characterized by strongly different dynamics than those of natural ecosystems. This involves hotspot properties such as element cycling intensity, microbial activation, lifetime or spatial extension. Evidence from studies around the globe suggests that key

hotspot characteristics intensify or increase under strongly limiting cropping conditions e.g. low-input agriculture: i) nutrient mining is more intensive around roots in infertile soils, ii) root exudates decompose more slowly under water limitation, and iii) the rhizo-hyphosphere forms a more spatially extended hyphal network under P deficiency. These examples suggest that smart management of hotspots might be a sustainable strategy to overcome soil limitations, not only for crop production on marginal soils but also as a strategy to save resources for future agriculture.
Here, we will present a set of studies applying management strategies, which actively modify hotspot intensity, lifetime or spatial extension with the aim to manipulate biogeochemical cycles of the respective agroecosystem. Most traditional, tillage enlarges the topsoil detritusphere or moves it to lower soil depths. Rather novel but increasingly studied approaches seek to modify rhizosphere properties: applying genotypes with i) specific root traits such as an optimized root morphology (e.g. modified root hairs or deeper fine root system) or ii) modified root exudate compositions and resulting rhizosphere microbiomes. Such approaches need to be applied site- and agroecosystem-specifically to optimize resource utilization. Moreover, as agroecosystems are under long-term controls, hotspot management strategies are not limited to one growing season but can stretch over years of cultivation. The generation of specific biopores – the root channels - created by e.g. tap-rooted or deep-rooting cover crops is a management practise inducing a rhizosphere-detritusphere-rhizosphere transition over time. 'Re-activated' hotspots feature unique biogeochemical conditions for young roots as well as microbial communities. Such 'highways to subsoil' foster rhizosphere establishment in subsoils, where i) hotspots remain moist and thus active under drought and ii) where gradients from hotspots to bulk soils are for magnitudes higher compared to topsoils. All these aspects present a unique, however largely unexploited potential for future agriculture, yet.
By a novel set of methodological approaches and their combinations, comprising multi-isotope applications, in-situ imaging techniques, biomarkers and microbial activity measures with high spatial resolution, this presentation will provide new insights into the potential of hotspot management in agroecosystems. Implications for crop production under resource limitation up to the potential for a sustainable development of future agricultural production systems especially in the face of projected climate change will be discussed.

16:05. Questions

16:10: Closing remarks

16:15: End

The Speakers:

Levke Valena Höche

Levke Höche is a Master student in biology with a focus on geobotany. She did her B.Sc. and M.Sc. at Kiel University. Her master thesis was carried out at the Institute for Ecosystem Research under Dr. Karin Schrieber. She is interested in plant population biology, specifically plant x pollinator interactions.

Dr. Tim Lachnit

Dr. Tim Lachnit studied biology at the Christian-Albrechts-University Kiel. After completing his PhD in the group of Prof. Dr. Tilmann Harder at the ICMB University Oldenburg in 2010, he received a scholarship funded by the German Research Foundation (DFG) to work on seaweed disease at the University of New South Wales in Sydney. In 2013 he got a postdoc position at the Centre for Marine Bio-Innovation and became Laboratory manager in the group of Professor Peter Steinberg. In Australia he received the FSC grant: "Emerging viral infections in a widespread ecosystem engineer" and the Faculty of Science Interdisciplinary Research Grant. Since 2014 he works in the department of zoology at the Christian-Albrechts-University Kiel under the direction of Prof. Dr. Dr. Thomas Bosch. In 2015, he was grant by the Volkswagen Foundation for his bold research ideas in the regulatory function of phages in host-microbe interactions. Today Dr. Tim Lachnit is principle investigator in the CRC 1182 working on phage regulated acclimatization of Hydra to changing environmental conditions.

Prof. Dr. Sandra Spielvogel

Prof. Dr. Sandra Spielvogel finished her PhD in 2009 from the Department of Soil Science, Technical University of Munich, and after that worked as a post-Doc in the same department. In 2011, she joined Institute for Environmental Science, University of Koblenz-Landau as a Senior Researcher. She was appointed as a Juniorprofessor (W1) in Institute for Environmental Science, University of Koblenz-Landau. Afterward, she worked as Professor for Soil Science in Geographical Institute, University Bern. Since September 2017, she is working as a Full Professor for Soil Science (W3) in the Institute of Soil Science and Plant Nutrition, CAU, Kiel.