CLIMATE CHANGE, WATER STRESS AND CROP PRODUCTION: WHEAT AND ITS MICROBIOME

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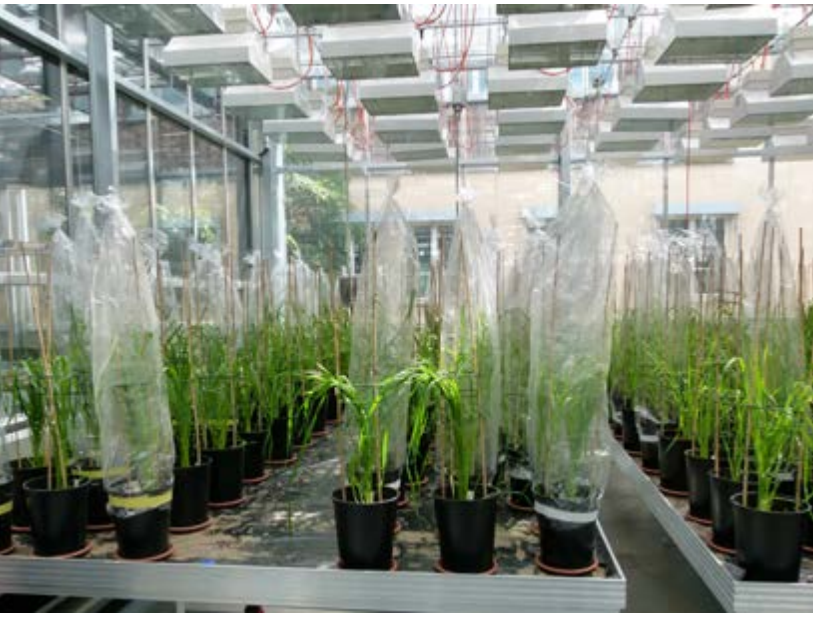

Pot experiment at the project partner IPK Gatersleben within the VOLCORN consortium using common wheat (Triticum aestivum L.). Individual plants were hermetically isolated in order to measure VOC emissions.

Climate change is causing an increase in extreme weather events that threaten global food production. Abiotic stressors such as floods and droughts reduce yields and make crops more vulnerable to pathogens and herbivores. Using wheat as an example, the VOLCORN project is investigating the role of the microbiome in the adaptation of plants to this intensified stress situation.

In light of more frequent extreme weather events due to climate change, the VOLCORN project is investigating the functional relationships between the crop plant wheat and its microbiome (i. e. all microorganisms colonising a plant). In collaborative experiments, the project partners are trying to prove that both partners – plant and microbiome – jointly react to environmental stressors, i. e. that they actually are a functional unit. The focus is placed on the volatile organic compounds (VOCs) they emit, which are important for the communication between plants and the protection against herbivores.

The VOLCORN research consortium consists of researchers from the IPK Gatersleben, the IGZ Großbeeren, the iDiv in Leipzig and the workings groups Microbial Biogeochemistry and Fungal Interactions at ZALF. The experimental study combines complementary and modern experimental methods of plant physiology, microbiomics and VOC analysis, aiming to investigate the entire wheat-microbiome complex. Initial results show that the microbiome-wheat plant complex reacts to flooding or water shortage in a coordinated manner, above- as well as belowground. In this process, potentially pathogenic fungi are accumulating. However, there is also evidence that plant growth-promoting bacteria become more abundant in the root zone. The central metabolism of water-stressed wheat plants reacts by redistributing energy resources to their roots. Due to the very dynamic and complex mixture of the emitted VOCs, the extent to which particular VOCs, which might be indicators for specific stressors, are produced, has not yet been conclusively elucidated. Yet it seems certain that under water stress, bacteria that can produce plant hormones such as auxin are accumulating in the root zone. These bacteria can stimulate root growth and may ultimately help the plant to counteract water stress.

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