“Microbiome interactions that enhance plant tolerance to abiotic stress: The threat of climate variability and climate change”

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Global crop production is at risk due to climate change, climate variability, population growth, and limiting of the arable land. Threatening environmental scenarios such as high and cold temperatures, flooding, and drought conditions expose plants to stress scenarios, reducing their yield and survival. Only innovative agricultural solutions can ensure food security for the future (McKersie, 2015). The most current innovations of plant breeding are genetic engineering; however the lower public acceptance limits its impact. A new way to help plant resist stress scenario is exploiting the plant’s symbiont microbiome and virome (Compant, 2010; Roossinck, 2011, 2013). Endophytic fungi are known by their symbiosis with plants, helping to increase biomass, decrease water consumption, efficient resource allocation, and conferring abiotic and biotic stress tolerance (Rodriguez et al. 2009). It has been shown that endophytic and rhizospheric fungi associated with plants growing in geothermal ecosystems play a role in host plant’s thermal tolerance (Zhou et al 2015). Vargas et al (2014) reported the involvement of *Gluconacetobacter diazotrophicus* in the promotion of drought-tolerance in sugarcane cv. SP70-1143 describing the initial molecular events that increased drought tolerance in the host plant. Plant viruses confer drought and cold tolerance to plants as a conditional mutualists. In beets (*Beta vulgaris* L.), infection with *Cucumber mosaic virus* (CMV) enhances plant’s thermal and water-stress tolerance (Xu et al., 2008). While, in a tropical panic grass (*Dichanthelium lanuginosum*), it has been demonstrated that an association with specific virus-infected fungal endophytes helps to tolerate temperatures up to 50 C (Márquez et al., 2007). Woodward et al (2011) proposed a symbiogenic strategy for mitigating the impacts of abiotic stress in agriculture based on their previous work on tomato and rice, demonstrating that endophytes are able to confer drought, salt, temperature, and disease tolerance in crop plants. Implications for future crop management strategies will be discussed.
References