Entry No. IRRC-0045

Category	: International Rice Research Conference
Select Theme	: Climate change and environmental sustainability
Endorsement email	:
Keyword 1	: Adaptation to climate change
Keyword 2	: Biodiversity
Keyword 3	: Climate smart agriculture
Title of Entry	: Physiological effects and transcriptomic profiling of rice plant-microbe interactions in a System of Rice Intensification (SRI) agroecosystem: identifying phenotypical modifications to deal with climate change
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Select only one type of presentation	: 15 minute oral presentation
Abstract	: Rice plant growth is influenced by combinations of genotype, environmental and management factors. Environmental factors include climate-change decreases in water supply and greater variability in weather that will affect global rice production. A well-researched and increasingly widely-utilized production methodology for countering constraints on rice farming is the System of Rice Intensification (SRI). SRI modifies common rice-production methods: transplanting younger seedlings with wide spacing, creating more aerobic soil conditions, enhancing soil organic matter, and reducing or eliminating agrochemical use which affects plant-microbe interactions. We report experiments that assessed under gnotobiotic conditions how SRI plants inoculated with symbiotic microbes differed in their physiology and productivity from conventionally-grown rice plants. Then the differential expression of rice plant genes was profiled by transcriptomic analysis using next-generation sequencing technology. The results showed significant increases, compared to controls, along several parameters in the rice plants that were under SRI management or after inoculation with symbiotic microbes. Some of the changes documented were increases in root growth and water-use efficiency in the photosynthesis of carbohydrates. These indicate greater resiliency of SRI plants against adverse effects of climate change. Transcriptomic study showed which genes

related to growth enhancement and physiological functioning were differentially expressed in plant grown under SRI conditions with symbiotic colonization by certain microbes. Genes related to photosynthesis, stomatal regulation, tiller development, and root development were found to be up-regulated in such rice plants. Agronomic and transcriptomic analyses showed symbiotic microbes having positive roles in mitigating climate-change effects by affecting plant growth, physiological traits, and molecular signaling. Pests and diseases are likely to become more prevalent with climate change. Previous work has shown SRI + Trichoderma-inoculation enhancing plants' resistance to pests and diseases, e.g., reducing susceptibility to sheath-blight. Our results indicate that SRI creates more favorable conditions for microbial populations to contribute toward beneficial rice cropping outcomes while conventional paddy management inhibits these effects. Endophytic microbes play a role in these differential gene expressions, but this relationship requires much more study.

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