Argelia Lorence, PhD

The Rice Resilience Revolution

Arkansas Researcher Protects State's #1 Crop from Low Yields

Dr. Argelia Lorence leads a quiet revolution from the Plant High-Throughput Phenotyping Facility at Arkansas State University (A-State) to identify the most resilient rice varieties and understand what makes them resilient. Her work has global implications amidst climate change and a growing population dependent on rice for livelihoods.

Dr. Lorence aims to better understand how plants adapt to drought, heat, and cold stresses that limit productivity and yield. In addition to her work at A-State, she co-directs the Wheat and Rice Center for Heat Resilience (WRCHR). This $6 million, NSF-funded project uses phenomics and other advanced imaging techniques to identify wheat and rice varieties that are tolerant to heat and help meet the challenges of a changing climate and growing world population. Her most ambitious study project studies rice varieties worldwide, looking for those tolerant to heat stress.

The Challenge

Rice crops face significant challenges as global temperatures rise, threatening food security and the livelihoods of billions of people. Rice is a staple for more than 3.5 billion people around the world, particularly in Asia, Latin America, and parts of Africa. Farmers, producers, and co-ops know all too well the pains of erratic rainfall patterns and that they cause droughts during crucial seedling stages and floods that submerge plants. Warmer night temperatures disrupt photosynthesis and disproportionately reduce yields compared to daytime stress. For every 1-degree night temperature increase, grain production declines 10%.

The Arkansas rice industry, valued at $6 billion, is a significant global player. However, the projected decline in yields due to temperature increases would mean an annual loss of $600 million for this industry alone.

New, collaborative approaches to rice cultivation are needed to ensure yields are enough to continue feeding the global population. Farmers can adapt by adjusting planting schedules, and plant breeders can focus on developing heat- and salt-tolerant seed varieties. Additionally, resilient heirloom strains of rice can be developed. Most importantly, we need to identify the most resilient rice varieties to these conditions.

Arkansas Research Alliance

The Solution

Dr. Lorence studies rice varieties worldwide, targeting those resilient to high-stress conditions, particularly high nighttime temperatures. Given the critical importance of rice production to countries like India and China, where reliance on the crop is crucial, the research holds immense global significance.

Arkansas is the top rice-producing state in the United States. Dr. Lorence's work is critical in preserving this industry in Arkansas. She and her team work to identify the most resilient rice varieties capable of handling the challenges of warmer night temperatures. This research has already uncovered two genes that make rice more resilient.

Specifically, Dr. Lorence studies vitamin C's role in plant health. Just as vitamin C helps the human body guard against stress, vitamin C helps plants combat stresses such as heat, cold, some pests, and drought. She aims to understand how plants produce vitamin C to develop strategies to improve their stress resistance and ensure future agricultural sustainability in the face of climate change.

Next Steps

Dr. Lorence's team has identified many rice varieties capable of producing higher levels of vitamin C that exhibited resilience to high nighttime temperatures. The team now plans to study the most promising 30 to 40 varieties of rice. By understanding why these varieties exhibit resilience, the team plans to collaborate with rice breeders to develop rice varieties that can thrive in future climate conditions.

In addition to rice breeders, the project seeks to engage experts in nutrient absorption to learn whether heat stress affects nutrient absorption in rice plants. The team is also collaborating with an entomology expert to investigate the potential impact of elevated nighttime temperatures on rice grain accessibility to insects, particularly those that pose threats during storage. This collaborative effort holds immense promise for safeguarding global food security amidst the mounting challenges posed by climate change.

To learn more about Dr. Lorence's research or to explore how you can support it, contact her directly at alorence@astate.edu. Your involvement and support are crucial in advancing this vital research and ensuring a sustainable future for global food security.

Contact

alorence@astate.edu