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1-1-2021

## **A Comparison of Root Architecture and Morphology of Two Cultivars of *Panicum virgatum* (Carthaga versus Shawnee) Under Temperature Variations**

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Adcock-Downey, Lawana, "A Comparison of Root Architecture and Morphology of Two Cultivars of *Panicum virgatum* (Carthaga versus Shawnee) Under Temperature Variations" (2021). *RCEU Project Proposals*. 38.

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**Project Title: A Comparison of Root Architecture and Morphology of Two Cultivars of *Panicum virgatum* ('Carthage' versus 'Shawnee') Under Temperature Variations.**

**Faculty Name:** Dr. Lawana Adcock – Downey, Full-Time Lecturer, UAH Department of Biological Sciences

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**Proposal Identifier: RCEU21-BYS-LAD-01**

**Project Description:** The inherent plasticity in root system architecture of any species of plant governs its ability to respond to its unique environmental conditions, acquiring nutrients, water and ions for survival. However, there are specific anatomical root features/traits that may confer one variety with a greater chance of survival over another. For example, a greater number of secondary roots, and increased root branching, enables a plant to acquire higher levels of ions and water. Plant breeders are now focusing on research to identify the specific root morphological traits, and the genes that control them, to genetically modify agricultural crops thereby better adapting them to specific field conditions. As a model system for study of root morphology, *Panicum virgatum*, or switchgrass, has been selected because it is considered to be one of the most stress tolerant species of grasses known. Yet, we still find variations within switchgrass cultivars that enable one to perform better in cooler temperatures while others have peak performance in higher temperature ranges. 'Shawnee' and 'Carthage' are two varieties of switchgrass known for high temperature versus low temperature resistance. The two cultivars will be subjected to variations in temperature and a comparison of root system data will be made to identify any unique root morphologies between the two grasses. Both switchgrass varieties will be grown in the UAH Greenhouse and analyzed using WinRhizo root system analytical software.

**I. Student Specific Duties, Contributions and Outcomes:**

**Specific Duties: COVID Conditions:**

**Due to the nature of the research, the student would (1) work independently in the Greenhouse in which he/she would be the only student in a 200 sq.ft. facility and (2) analyze data with the WinRhizo software in Room 257, in which they would be the only**

**individual utilizing that room. Both the UAH Greenhouse and Room 257 would be appropriately cleaned by the researcher, Dr. Adcock.**

The student selected would be specifically responsible for: (1) establishing the experimental design of the project i.e. numbers of repetitions and seeds to plant for statistically significant analysis of two switchgrass cultivars (2) germination of seed and maintenance of the plants in the UAH Greenhouse (2) collection of all experimental data during the growth phase of the project (3) preparation of root growth chambers in the Greenhouse (4) analyzation of data using WinRhizo software (5) establishment of a data base of all experimental material. The student would be expected to meet with the mentor twice weekly via Zoom Sessions to discuss progress and data analysis.

**II. Tangible Contributions:** Tangible contributions made by the student will include: (1) preparation of a technical report to be submitted to Perpetua (2) poster presentation at the annual UAH Undergraduate Research Poster Event (3) experience in statistical analysis and experimental design of a research project.

### **III. Specific Outcomes:**

**A. Skill-based outcomes** for the student will include: (1) experience in management of plant growth and care for research purposes, (2) data acquisition using a software system for root analyses

**B. Knowledge-based outcomes** for the student will include: (1) an understanding of root system development in plants (2) experience in statistical analyses of experimental data (3) use of a novel software portfolio for data acquisition and analysis.

### **IV. Faculty Requirements and Mentorship:**

#### **A. Faculty Requirements:**

(1) Student with a minimum of junior level standing

(2) Student with minimum background to include BYS 119 or BYS 120 **B.**

#### **Faculty Preferred Requirements:**

(1) Student with senior level standing at the onset of the Summer semester (2) One course from the following classes: (BYS 417 Principles of Plant Physiology; BYS 491 Special Topics in Plant Physiology; BYS 302 People, Plants and the Environment): in addition to BYS 119 or 120.

**C. Faculty Mentorship:** The student will interact with the primary mentor a minimum of two times weekly at a prearranged time. Discussions will include issues and concerns developing with the project as well as a review of major factors affecting plant root growth.

