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Growth of Sisal Plants (*Furcraea castilla* and *F. macrophylla*) under Flooding Stress

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Abstract

Flooding is an environmental stress in many ecosystems worldwide. In tropical and subtropical regions, severe crop losses are caused by prolonged seasonal rainfall due to climatic disturbances such as El Niño. This phenomenon creates increased rainfall across the east-central and eastern Pacific Ocean. Excess of water produces anoxic soil conditions within a few hours. Plant roots, consequently, suffer hypoxia or anoxia, which results in an energy crisis affecting the plant growth. Genetic diversity in the plant response to flooding includes alterations in architecture, metabolism, and elongation growth associated with a low O₂ escape strategy and an antithetical quiescence scheme that allows endurance of prolonged submergence. *Furcraea* is a genus of succulent plants belonging to the family Agavaceae, native of tropical regions of Mexico, the Caribbean, Central America and the northern of South America. The present study aims to determine the leaf and root growth of two sisal species (*Furcraea castilla* and *F. macrophylla*) growing under flooding stress in an open field in Tunja-Colombia. Plants bulbils were sown in plastic bags filled with 3 kg of soil. Control plants were watered every four days while flooded plants were watered in a way that the water surface remained 1 cm high over the soil surface and were covered with another plastic bag in order to limit the drainage. In both species, the total dry matter per plant, the specific leaf weight and the leaf area were depressed by flooding; in contrast, the total root length was increased 94,2% and 74,7% in *F. macrophylla* and *F. castilla* respectively, compared to controls. The root to shoot ratio was reduced by flooding in *F. Macrophylla*, whereas in *F. castilla* was increased. Although both species were strongly affected by flooding, *F. macrophylla* showed to have a better adaptation to this stress factor than *F. castilla*. The results suggest that farmers should be cautious by selecting and adapting the *Furcraea* species in regions with high rainfall and heavy soils as these conditions limit the oxygen diffusion in soil and consequently plants growth and yield could be reduced.

Keywords: Agavaceae, hypoxia, sisal