

OFFICIAL ABSTRACT and CERTIFICATION

Increasing the Desiccation Tolerance of Eragrostis tef through Exogenous Application of Absciscic Acid to Ensure Food Security for the Future

Sara Mc Sweeney

Harrison High School, Harrison, New York, USA

With the world population expected to reach almost ten billion by 2050 and the large loss of agricultural land due to climate change, food security has become one of the largest issues for governments and farmers today. Eragrostis tef is a gluten-free, highly nutritious staple crop for Ethiopia that has the potential to ensure food security. It is drought tolerant, but only partially desiccation tolerant, meaning that it will still die if it loses much of its water. Absciscic acid (ABA), a plant hormone, has been known to confer desiccation tolerance when applied exogenously to seeds. The purpose of this study was to increase the desiccation tolerance of E. tef through exogenous application of ABA so that more countries can use it as a food source. This experiment was conducted in two stages: an optimization and proof of concept, and an experimental procedure. Due to the fact that E. tef was a precious resource, the model organism Arabidopsis thaliana was used in the optimization stage. It was determined that seeds were not the ideal tissue for ABA application because of low germination rates, possibly due to a barrier created by the seed coat. Therefore, in the experimental stage, calli, or masses of undifferentiated cells, of E. tef were used to ensure that ABA was taken up. The hypothesis that ABA would increase the desiccation tolerance of E. tef calli was supported, as ABA-treated calli had a higher relative water content, lower electrolyte leakage, and higher overall chlorophyll and carotenoid content.

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