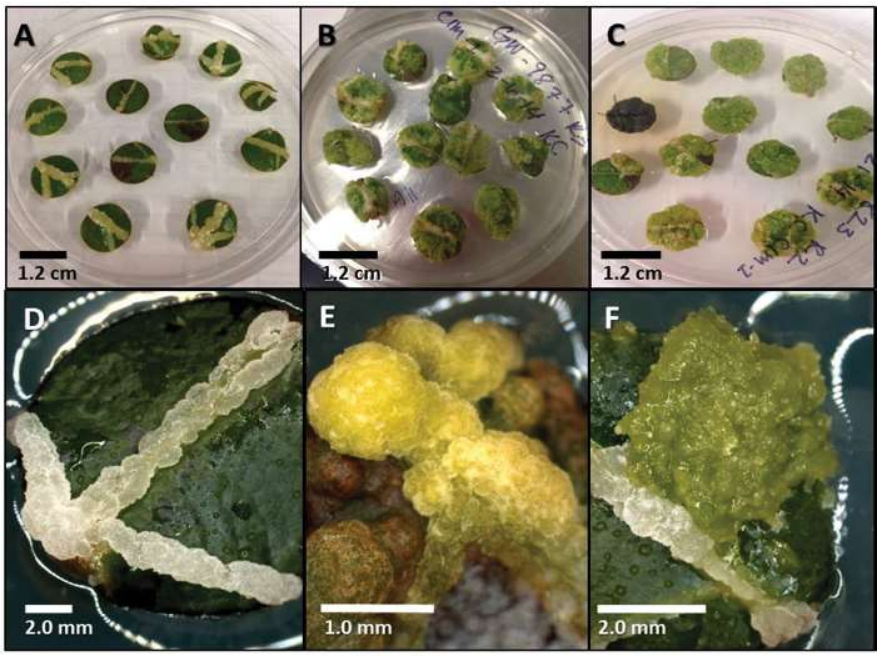
# Rapid Regeneration of Recalcitrant Plant Species

**Problem:** Despite rapid advances in development of genome-editing tools such as CRISPR-Cas9, regenerating viable plants during transgenesis remains a major barrier to cost-effective deployment of these tools in the biotechnology field to enhance plant performance.

**Solution:** Enhancing regeneration of inherently recalcitrant plant species can be achieved by utilizing four major regulators of DNA replication and cell division that are highly conserved across eukaryotes. Developments in this area would broaden the portfolio of genome-editable plant species. A four-gene construct carrying 2-RNAi-mediated gene-silencing cassettes as well as 2-overexpression cassettes will simultaneously inhibit cell division suppressors (i.e., SOK1 kinase and Histone Deacetylase RPD) and enhance the activity of cell division inducers (i.e., mitogen-activated protein kinase and targeting protein for XKLP2).




**Impact:** This genetic technology leverages materials and methods to improve the transformation efficiency of plant cells, particularly for those commercially important species that have been difficult to genetically engineer or where transformation efficiencies are low. The simple, easy-to-use approach enhances the efficiency of callus regeneration to enable the creation of intact fertile plants bearing desired genetic improvements.


Publications

- G. A. Tuskan, et al. Defining the Genetic Components of Callus Formation: A GWAS Approach." *PLOS ONE*, 2018; 13.8: e0202519.



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Dr. Wellington Muchero is a quantitative geneticist in the Biosciences Division at ORNL. He holds joint appointments in the Plant Sciences Department and the Bredesen Center for Interdisciplinary Research and Graduate Education at the University of Tennessee–Knoxville. Dr. Muchero received a PhD in plant pathology from the University of California, Riverside, and an undergraduate degree in crop science from California State Polytechnic University, Pomona. He is a 2016 recipient of the US Department of Energy's Early Career Research award. He holds three issued patents, three technology licensing agreements, and numerous invention disclosures related to plant biotechnology.

## Intellectual Property

Genes regulating plant regeneration; ID-201804190

Genes regulating plant regeneration; 16/525,724 and PCT/US2019/044048


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