P285 @NadiaNazihM

Small-kernel ears result when *Sorbitol dehydrogenase1 (Sdh1)* is dysfunctional

(submitted by Nadia Mourad Silva <nmourad@ufl.edu>)
Full Author List: Mourad Silva, Nadia N.[1]; de Sousa Tinoco, Sylvia M.[2]; Sanclemente, Maria A.[3]; Gray, Katherine E.[1]; Joe, Sarah E.[1]; Saunders, Jonathan W.[1]; Guan, Jiahn-Chou[1]; Rolletschek, Hardy[4]; Borisjuk, Ljudmilla[4]; Koch, Karen E.[1]
[1] University of Florida, Department of Horticultural Sciences, Fifield Hall 2550 Hull Rd., Gainesville, FL, 32611 USA
[2] Embrapa Maize and Sorghum, Rod MG 424 Km 45, Sete Lagoas, MG, 35701-970 Brazil
[3] Utrecht University, Heidelberglaan 8,3584 CS Utrecht, Netherlands
[4] Institute of Plant Genetics and Crop Plant Research (IPK), Corrensstr. 3, D-06466 Seeland-Gatersleben, Germany

Maize kernels rapidly synthesize and metabolize sorbitol via sorbitol dehydrogenase (SDH, EC 1.1.1.14). Maize SDH catalyzes the reversible interconversion of fructose + NADH ↔ sorbitol + NAD^+. The reaction is suggested to favor sorbitol and NAD^+ synthesis in the high-sugar, low-oxygen interior of the endosperm and possibly the reverse in other locales. However, the physiological roles of sorbitol synthesis and the fate of sorbitol in the maize kernel remain elusive. A single copy *Sdh1* gene encodes maize SDH expressed almost exclusively in the endosperm during grain fill. Preliminary analysis of a new, *Ac/Ds*-induced *sdh1* mutation indicates that it confers a small-kernel phenotype similar to that observed for a *Mu*-induced *sdh1* allele, suggesting a possible role in kernel development. We have also observed enhanced seed set in the *sdh1-Ds* mutant during multiple growing seasons but are yet to define possible mechanisms for this aspect of the *sdh1* phenotype. For physiological effects on kernel size, we hypothesize that maize SDH can aid regeneration of NAD^+ in the low-O_2 endosperm, thus aiding glycolytic flux and helping sustain kernel growth. Characterization and biochemical analysis of *sdh1* mutants are ongoing, with preliminary results showing a ~10x decrease in sorbitol and an increase in fructose and sucrose in the mutant. The physiological and genetic effects of *Sdh1* on kernel development are being further evaluated in over-expression transgenic lines and in sweet corn, where soluble sugar levels are high. Outcomes will determine the suitability of *Sdh1* and its regulators as possible targets for genetic manipulation or metabolic engineering to alter quality and/or quantity of maize kernels.

Gene / Gene Models described: *sdh1*; Zm00001d031727
Funding acknowledgement: National Science Foundation (NSF)