

**Dr. David Braun**  
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Thursday, January 17, 2008  
11:30 a.m.  
101 Biochemistry

**Tie-dyed1 encodes a novel protein controlling carbohydrate  
accumulation in leaves**

**Research in the Braun Laboratory**

My lab is interested in the signals and genetic programs coordinating leaf development and function. Studies of maize leaf development have shown that clonal (mother to daughter cell) lineages are arranged longitudinally along the long axis of the leaf. To identify genes coordinating regional leaf identity we screened for mutants with sectors that extend laterally to cells beyond the clonal lineages. A recessive mutant, *tie-dyed1* (*tdy1*), was identified with yellow and green pigmented leaf sectors that violate cell lineage boundaries. We determined that *tdy1* sectoring requires high light, is restricted to a narrow developmental time and results in the yellow tissue hyperaccumulating sugars and starch. Cloning the gene determined that it encodes a novel protein expressed in veins. From these and other data we propose that TDY1 acts as a sugar flux or an osmotic stress sensor to up-regulate sugar export into the veins. In the mutant, because different regions of leaves express different phenotypes, we hypothesize that TDY1 functions to maintain sugar level homeostasis and that the physiological threshold for sugar accumulation determines the regional phenotype. From our work, the way in which physiological thresholds can mediate phenotypic variation will be discussed.

**References**

Yi Ma, R. Frank Baker, Maria Magallanes-Lundback, Dean DellaPenna, and David M. Braun, (2007) *Tie-dyed1* and *Sucrose export defective1* act independently to promote carbohydrate export from maize leaves. *Planta*, (doi:[10.1007/s00425-007-0636-6](https://doi.org/10.1007/s00425-007-0636-6))

R. Frank Baker and David M. Braun, (2007) *tie-dyed1* functions non-cell-autonomously to control carbohydrate accumulation in maize leaves. *Plant Physiology*, 144: 867-878

David M. Braun, Yi Ma, Noriko Inada, Michael Muszynski and R. Frank Baker, (2006) *tie-dyed1* regulates carbohydrate accumulation in maize leaves. *Plant Physiology* 142: 1511-1522.