

## **Oil Accumulation in Leaves Directed by Modification of Fatty Acid Breakdown and Lipid Synthesis Pathways**

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Plant oils in the form of triacylglycerol (TAG) are used for food, industrial feedstock and biofuel manufacture. Although TAG is typically harvested from the fruit or seeds of oil crop species, plants can also accumulate small amounts of TAG in the leaves and other vegetative tissues. Here we show that leaf TAG levels can be increased significantly (10-20 fold) by blocking fatty acid breakdown, particularly during extended dark treatments or leaf senescence in the model plant *Arabidopsis*. Generation of a double mutant in fatty acid breakdown and diacylglycerol acyltransferase 1 (*DGAT1*) resulted in a severe vegetative growth phenotype suggesting that partitioning of fatty acids to TAG in leaves is carried out predominantly by this acyltransferase. *LEC2*, a seed development transcription factor involved in storage product accumulation, was ectopically expressed during senescence in the fatty acid breakdown mutant *COMATOSE* (*cts2*). This resulted in accumulation of seed oil type species of TAG in senescing tissue. Our data suggests that recycled membrane fatty acids can be re-directed to TAG by expressing the seed-program in senescing tissue or by a block in fatty acid breakdown. This work raises the possibility of producing significant amounts of oil in vegetative tissues of biomass crops such as *Miscanthus*.