

Expression of Eastern Cottonwood (*Populus deltoides*) Eukaryotic Translation Initiation Factor-5A3 in Alfalfa (*Medicago sativa* ssp. *sativa* L.)

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Distinguishable forms of post-translationally modified eukaryotic translation initiation factor 5A (eIF5A) regulate senescence and growth in cells. The up-regulation of eIF5A growth isoform in various plant species has resulted in enhanced growth and enhanced tolerance to sub-lethal stresses including nutrients, drought, salt, and heat (personal communications John E. Thompson). The eIF5A growth isoform (PdeIF5A3) of Eastern Cottonwood (*Populus deltoides*) has now been expressed in alfalfa (*Medicago sativa* ssp. *sativa* L.) using the constitutive figwort mosaic virus (FMV) promoter. *In vivo* studies designed to quantify changes in herbage yield of various genetically transformed alfalfa plants (transformants) containing the chimeric FMV-PdeIF5A3 transgene were conducted in a controlled growth room environment. Ramets of each transformant and wild-type plant were grown in soilless potting mix under four nutrient solution levels. Nutrient solution (20-20-20) was applied twice weekly at 0.0, 0.5, 1.0, or 3.0 g L⁻¹. Wild-type herbage yield under the 0.0 g L⁻¹ treatment was reduced 76% as compared to the 3.0 g L⁻¹ treatment. Wild-type herbage yield under the 0.5 and 1.0 g L⁻¹ treatments was reduced 41 and 48%, respectively. Several unique FMV-PdeIF5A3 transformants that exhibited higher herbage yield were identified. Transformant herbage yield under the 0.0 g L⁻¹ treatment was increased up to 231% as compared to the wild-type control under the same treatment. Similar comparisons within the 0.5, 1.0, or 3.0 g L⁻¹ treatments demonstrate transformant herbage yield increases up to 162, 200, and 116%, respectively. RT-PCR amplification of PdeIF5A3 RNA sampled from transformants and wild-type plants, suggest moderate levels of PdeIF5A3 expression may promote significant increases in herbage yield whereas relatively high levels of PdeIF5A3 expression may reduce herbage yield. Further characterization of the various PdeIF5A3 alfalfa transformants for tolerance to drought, salt, and/or heat stress will be helpful in the identification of events having commercial breeding potential.