

Assessment of Chemical Composition from Progenies of Alfalfa Down-Regulated in Lignin Biosynthesis

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Lignin content plays a pivotal role in determining forage quality and conversion efficiency of plant biomass to bioethanol. Genetic modification of lignin biosynthesis in alfalfa improves conversion efficiency for bioethanol production. However, improvement in bioprocessing properties in alfalfa may be accompanied by alterations in plant physiology and productivity. The objective of this study is to identify reduced lignin alfalfa lines with improved bioprocessing efficiency and good agronomic performance. Independent crosses of a common male-sterile alfalfa with transformed alfalfa lines independently down-regulated in key enzymatic steps of the monolignol biosynthetic pathway produced full-sib T₁ progenies segregating for lignin content. The pipeline for screening plants includes identification of insert copy number in the T₀ plants and PCR to determine the presence of the transgene in each of the progenies. Segregating T₁ progenies were evaluated in the greenhouse and field conditions in Ardmore, Oklahoma for their lignin content and composition, forage quality, agronomic and physiological characteristics, and biomass production. Our findings will enable us to capture the full value of lignin modification technology by developing strategies that incorporate yield enhancement into plants with changes in cell wall chemistry.