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U.S. Department
of Transportation



Title: Conversion of Eastern Redcedar to Butanol using a Novel Biocatalytic Process

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Rationale

Butanol is a more desirable fuel than ethanol due to its higher energy density and compatibility with gasoline and existing fuel infrastructure. Butanol has been produced by the traditional acetone-butanol-ethanol (ABE) fermentation using molasses, hydrolyzed starches and recently from lignocellulosic biomass. The ABE process has low conversion yields, prohibiting commercialization. It is critical that the conversion efficiency is increased to make butanol production viable. To address this issue, the research team is developing a novel biocatalytic process with butanol yields 20% higher than traditional ABE technology. The overall goal is to develop sustainable and feasible bioconversion of Eastern redcedar into butanol. Their two objectives are determining conditions favorable for butanol production and process development, and optimizing reactor conditions to maximize butanol productivity and yield.

Expected Outcomes

Successful completion of this project will involve development of a novel biocatalytic process with increased conversion efficiency to make biofuels. At the conclusion of this project, Atiyeh's research team will identify the factors that result in maximum butanol productivity and yield. Increased butanol and alcohol yields from the developed process in a facility that utilizes 2,000 dry metric tons of Eastern redcedar per day is expected to result in an increase in net revenues of over \$33 million per year when compared to traditional sugar fermentation. Additionally, an attractive opportunity exists for Oklahoma in the use of Eastern redcedar, which is a tree that is regarded as a pest by most ranchers and rural landowners. It is estimated that there are over 11 million metric tons of redcedar in northwestern Oklahoma. The infestation of redcedars across grasslands in the Central Plains has resulted in lost pasture for cattle grazing, water use by the trees and allergy problems during pollination. This project will not only allow reduction of the redcedar infestation problem, but also convert them into transportation fuels.



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