

Optimizing Bioethanol Production from Eastern Red Cedar Sawdust

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The need for clean, renewable energy sources is critically important as fossil fuels are consumed and environmental damage increases globally. Ethanol is a useful and versatile energy source with desirable qualities including ease of manufacturing and clean burning. The challenge for ethanol production is finding a suitable, abundant biomass which could be refined and converted to bioethanol using a low energy and non-toxic method. The purpose of this study was to test various methods of pre-treatment and enzyme usage to identify the highest possible yield of bioethanol from Eastern Red Cedar sawdust through yeast fermentation. It was hypothesized the sample pretreated with a combination of acidic and alkaline conditions would produce the greatest amount of ethanol after 16 days. The experiment included a 3-week pre-treatment under neutral, acidic, and/or alkaline conditions followed by an introduction of increasing amounts of Rid-X® enzyme powder, containing cellulase, amylase, protease, and lipase, along with pectinase. After one week of enzymatic hydrolysis, a constant amount of yeast (*Saccharomyces cerevisiae*) was utilized to begin the fermentation stage. The results partially supported the hypothesis, as the sample with the combination of pH conditions produced the most ethanol (825 mg/dL), at the 8-day mark rather than the 16-day mark. The control group with water only with 4 grams of Rid-X at 16 days produced the least amount of ethanol (15 mg/dL). This study illustrates the potential for sawdust to be an effective substrate to be used in bioethanol production when the optimal pre-treatment and hydrolyzation methods are used.