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.

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