

Abstract

Vanillin is a high value aromatic compound belonging to the aldehydes. It is characterized by its pleasant smell and sweet taste. Widely used in the food, pharmaceutical, and fragrance industries. The increasing demand for vanillin has led to the exploration of alternative and renewable sources as lignin.

This project focuses mainly on the production of vanillin from different type of lignin, which is considered one of a major component of plant biomass that is abundant and unexploited. This project includes two parts; the first part focuses on isolating lignin using Organosolv and alkaline treatment, measure total lignin content in sawdust and pulp by Klason method, determined sugar content, and analyzed the isolate lignin using Fourier-transform infrared spectroscopy (FT-IR). In the second part, vanillin was extracted from sawdust and Organosolv lignin through the nitrobenzene oxidization. In addition, vanillin was extracted through the fractionating alkaline lignin with a copper sulfate pentahydrate. Then, the vanillin samples analyzed using High Performance Liquid chromatography (HPLC). Finally, a mass balance was performed, and an economic study for the project.

The key findings from this study, the recovery yield of Organosolv lignin was $13.86 \pm 6.7\%$ with a sugar concentration of 188.8 g/L, while the recovery yield of alkali lignin was 29% with a sugar concentration 92 g/L. The results indicated that the total lignin content in sawdust was 38%, while it decreased in pulp to 20%. Also, the FT-IR results showed that the lignin samples were consistent with literatures. Vanillin yields were determined by HPLC analysis after the oxidation of sawdust and Organosolv lignin using nitrobenzene, resulted in yields of 0.084% and 0.39%, respectively. While the fractionation of alkali lignin showed a yield of 1.78%. The results of the economic feasibility study showed that the project faces economic challenges under the current circumstances, but there is a possibility of improving economic performance by developing operations to increase vanillin production or reduce operating costs.