

Preparation of cellulose pulp from oil palm empty fruit bunches

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Objectives

As a source of palm oil, oil palm is one of the most important tree species in Southeast Asian countries such as Malaysia. However, fibrous wood-like residues that remain after oil production have not been effectively utilized so far. These are called empty fruit bunches (EFB, Photo 1) and alternative forms of utilization of EFB include the production of cellulose pulp, or dissolving pulp (DP). DP is used as a raw material of cellulose derivatives or regenerated cellulose. In this study, the preparation of DP from EFB using environment-friendly chemical technologies and methods was conducted.

Results

The pulping process employed in this study used soda– anthraquinone (AQ), which does not include a sulfur element that causes water pollution. EFB fibers were first hydrolyzed with dilute sulfuric acid (pre-hydrolysis), followed by the soda-AQ pulping. Ozone (O₃) bleaching was then carried out on the pulp at room temperature with or without alkali extraction afterward. O₃ is a powerful and less pollutant reagent in pulp bleaching, which has the potential to replace bleaching processes using chlorine-containing reagents. Chemical properties of the pulps are shown in Table 1; a pulp prepared without pre-hydrolysis (Pulp C) and a commercial softwood DP are shown for references. Contents of α -D-glucopyranan (an indicator of cellulose purity) approached 90% and above for the pre-hydrolyzed pulps (A and B), which is an acceptable level in comparison with the commercial DP. Ash and pentosan contents of the pulps, which are indicators of cellulose impurity, were also present in comparable levels. Comparing A and B, the higher α -D-glucopyranan content of A is indicative of the effectiveness of alkali extraction after O₃ treatment for increasing cellulose purity. Above all, it is concluded that EFB has significant potential as a raw material to be utilized for dissolving pulp in an environment-friendly manner.



Photo 1. An empty fruit bunch (EFB, top) and its fibrous form (bottom).

Table 1. Chemical properties of EFB pulps.

	Preparation condition	-cellulose content (%)	Ash content (%)	Pentosan content (%)
A	Pre-hydrolysis pulping ozone alkali extraction	95.1	0.09	1.8
B	Pre-hydrolysis pulping ozone	88.6	0.06	1.8
C	Pulping ozone	77.9	0.12	24.2
	Commercial softwood DP	92.3	0.14	2.5

References

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