**Lignin valorization for future biomaterial from *Acacia sp* wood**

**Try Purwanti1\*), Muhammad Dhifas1), Nissa Nurfajrin Solihat2), Faizatul Falah2), Deni Zulfiana2), Fahriya Puspita Sari2), Maya Ismayati1), Widya Fatriasari2), Deded Sarip Nawawi1)**

1Department of Forest Products, Faculty of Forestry, IPB University (Bogor Agricultural University), Bogor, Indonesia

2Research Center for Biomaterials, Indonesian Institute of Sciences (LIPI), Cibinong 16911, Indonesia

\*Corresponding Author E-mail: [try\_anti64@apps.ipb.ac.id](mailto:try_anti64@apps.ipb.ac.id)

*Abstract:* Acacia Sp. is a fast-growing tree which is commonly used as a raw material in pulp and paper industry. Pulp and paper industry produced black liquor as by-product where 40% chemical content of black liquor is lignin. Lignin consists of many functional groups such as phenolic and methyl group which have potency as antimicrobial agent for textile and packaging. In this study, we compared lignin that was isolated from two different sources black liquor*: Acacia mangium* and *Acacia crassicarpa*. Lignin was isolated by dilute acid precipitation and was washed six times by deionized water. Furthermore, lignin was separated by centrifugation at 8000 rpm for 10 min and was dried in oven at 45 ºC for overnight. Chemical and physical properties of lignin were investigated such as acid insoluble lignin, acid soluble lignin, UATR FTIR, DSC, TGA, and py-GCMS. Antimicrobial performance of lignin 1 (from *A****.*** *crassicarpa*) was done against *Propionibacterium acnes and Staphylococcus aureus* because it will be applied in textile. Lignin 2 (from *A. mangium*) was evaluated against *S. aureus* and *Escherichia Coli* because it will be used as additive food packaging. Both lignin 1 and 2 was successfully isolated with total yield of 35% and 30% with total acid insoluble lignin about 98%. Functional group of both lignin showed unique peaks correspond to Guaiacyl ring (G), Syringil rings (S), dan aromatic C-H in G>S respectively at 1265, 1210, dan 1110 cm-1 with peak intensity of S was sharper than G. This finding was in correlation with py-GCMS result where syringol content was more abundant than guaicyl with S/G ratio of 1.4 for Lignin 1 and 1.36 for Lignin 2. The thermal degradation result for lignin 1 presented thermal stability until about 253 ºC with residue 28% at 750 ºC where lignin has the glass transition temperature (Tg) 169 ºC. Meanwhile, the thermal stability of lignin 2 is about 243 ºC with residue 33.4% at 750 ºC and the glass transition temperature (Tg) is 149 ºC. Lignin 1 in DMSO with concentration of 0.1 g/mL showed best antimicrobial properties against *P. acne* and *S. aureus* with inhibition zone 0.45 cm and 0.35 cm. Lignin 2 showed its best antimicrobial properties in DMSO against S.aureus with inhibition zone 0.7 cm in 0.3 g/mL lignin and against E.coli with 0.55 cm in 0.4 g/mL lignin.

*Keywords: antimicrobial activities, Acacia wood, black liquor, physico-chemical properties, biomaterial products*