

## ABSTRACT

Rice straw generally consist of cellulose (32-47%), hemicellulose (19-27%) and lignin (5-24%). An alkaline hydrogen peroxide solution is used in the lignin isolation process. Lignin was degraded by alkaline nitrobenzene oxidation into vanillin. The characterization of lignin and vanillin is done by UV spectroscopy and FT-IR spectroscopy. The FT-IR analysis of lignin samples isolated from rice straw chemical structures revealed formate ester and unconjugated carbonyl stretching absorption in the  $1700\text{ cm}^{-1}$  region in all lignin samples. The esterification of the phenol and alcohol of the propane chain (C and C), which occurs during the extraction process using hydrogen peroxide and sodium hypochlorite, is responsible for the bands at  $1716\text{ cm}^{-1}$  and  $1711\text{ cm}^{-1}$ . Aromatic compounds (phenolic hydroxyl groups) have bands between  $1600$  and  $1500\text{ cm}^{-1}$  which are attributable to aromatic skeleton vibrations. Both syringyl and guaiacyl are present in the chemical structure of lignin, as indicated by the bands at  $1300\text{ cm}^{-1}$  (syringyl) and  $1200\text{ cm}^{-1}$  (guaiacyl). The stretching (broad band) and bending (medium band) vibrations of the  $-\text{OH}$  group are found in the FTIR spectra of vanillin at  $3178$  and  $1265\text{--}1296\text{ cm}^{-1}$ , respectively. With a weak band absorption, stretching vibration  $\text{C-H}$  can be detected at  $2847\text{--}3024\text{ cm}^{-1}$ . Stretching and bending vibrations of the aldehyde group ( $\text{C=O}$ ) have prominent peaks at  $1666$  and  $632\text{ cm}^{-1}$  respectively. Stretching vibrations of  $\text{O-CH}_3$  appeared at  $1026\text{ cm}^{-1}$  with a medium intensity and stretching vibrations of the  $\text{C=C-C}$  group appeared at wavenumbers between  $1427$  and  $1589\text{ cm}^{-1}$ . Non-conjugated phenolic groups in the lignin sample in UV spectra absorb at  $280\text{--}285\text{ nm}$ , while conjugated phenolic groups (p-coumaric and ferulic acids) absorb at  $345\text{--}350\text{ nm}$ . The absorption peaks in UV spectra of vanillin are nearly identical, notably in the area between  $242$  and  $254\text{ nm}$ .

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