

# **Structural and composition modification of Harum Manis mango (*Mangifera indica*) leaves via chemical pretreatment for bioethanol production**

## **Abstract**

Harum Manis mango leaves are considered lignocellulosic (LC) biomass that could contribute to the production of second generation (2G) bioethanol. However, pretreatment should be conducted to overcome the recalcitrance of LC biomass prior to bioethanol production. Hence, this study aims to elucidate the structural changes of the biomass of Harum Manis mango leaves after single-stage and two-stage chemical pretreatment. The Harum Manis mango leaves were treated with only acid, only alkaline, acid-alkaline, or alkaline-acid process. One per cent (v/v) sulphuric acid and 1% (w/v) sodium hydroxide were used as the acid and alkaline hydrolysing agent in the four approaches of pretreatment, respectively. Consequently, the pretreated biomass was enzymatically hydrolysed to produce reducing sugar followed by the conversion into bioethanol through yeast fermentation. Acid-alkaline pretreatment yielded the highest holocellulose composition of 95.26%, with the highest delignification effect of  $86.97 \pm 1.26\%$ . Furthermore, Fourier transform infrared (FTIR) spectroscopy and X-ray powder diffraction (XRD) validated the acid-alkaline pretreated biomass to be the most feasible substrate for bioethanol production in this study. Finally, the maximum fermentable sugar content and bioethanol concentration of  $415.02 \pm 7.01$  mg/g and  $1.57 \pm 0.06$  mg/ml, respectively, were obtained.

## **Keywords**

Chemical pretreatments; Enzymatic saccharification; Fermentable sugar; Mango leaves; Second generation bioethanol