

## Production of Reducing Sugars from Hydrolysis of Napier Grass by Acid or Alkali

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### ABSTRACT

*This study investigated the effects of particle size and type of acid and alkali on hydrolysis of napier grass to obtain reducing sugars. Dried napier grass was milled and sieved through a 60, 80, or 100 sieve mesh. Hydrolysis was performed in an autoclave at 122°C and 15 psi; the hydrolysis time was varied at 60, 90, 120, or 150 minutes. Each size of dried napier grass was hydrolyzed in four solutions: hydrochloric acid, sulfuric acid, potassium hydroxide, and calcium hydroxide at the same concentration of 2% v/v. The concentrations of obtained reducing sugars were examined with the phenol-sulfuric method and compared with a calibration curve of a standard glucose solution. The results showed that acid hydrolysis yielded a significantly higher concentration of reducing sugar than alkaline hydrolysis. Moreover, hydrolysis with hydrochloric acid yielded the highest concentration of reducing sugar (44.24 g/L at 90 minutes), which was slightly higher than that with sulfuric acid (41.83 g/L at 150 minutes). Alkali hydrolysis yielded only very low concentrations of reducing sugar, despite hydrolysis times of more than 150 minutes. SEM images highlighted the differences in napier grass structure between untreated and after-hydrolysis samples. TGA analysis on the napier grass residue explained the effect of hydrolysis on the degradation of light volatile compounds in napier grass.*

**Keywords:** Napier grass, Hydrolysis, Reducing sugar, Phenol-sulfuric method

### INTRODUCTION

Napier grass (or elephant grass) is a perennial grass widely used for animal feed. It has also been identified as a promising feedstock candidate for bio-based alternative energy (Lewandowski et al., 2003). Napier grass can be harvested in 3-4 months and is resistant to drought (Angima et al., 2002). Lignocellulosic material in napier grass has been converted through hydrolysis with acidic or alkaline solutions, in which the chemical bonds of the material are broken down (Takata et al., 2013). The hydrolysis yields glucose, unless the reaction is partially completed, in which case cellobiose is obtained. Aguilar et al. (2002) found that 2% sulfuric acid and 122°C were the optimal conditions for hydrolysis of sugar