Bioethanol Production from Enzymatic Hydrolysis of Rio Sweet Sorghum Bagasse Grown in Kenya.

B. G. Mukabane[1]; G, Thiongo[2];**B. B. Gathitu***[3]; H.Murange [4], W. O. Owino[5]

[1] The Institute for Energy and Environment Technology ,Jomo Kenyatta University of Agriculture and Technology; [2]George Thiongo Department of Chemistry, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya; [3]**Benson B. Gathitu**, **Department of Chemical and Petroleum Engineering, Technical University of Kenya,** [4] Hunja Murage
, Department of Horticulture, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya; [5]Willis O. Owino, Department of Food Science and Technology,Jomo Kenyatta University of Agriculture and Technology,

Abstract:
Sweet sorghum (Sorghum bicolor (L) Moench) is a crop analogous to sugarcane with similar accumulation of sugars in its juicy stems and has a high yield of green biomass (20-30t/ha), and a huge amount of lignocellulosic residue are produced as byproduct of sweet sorghum. The present study was undertaken with the objective of determining the potential of sweet sorghum bagasse (SSB) to produce bioethanol hence find a sustainable source of biofuel and spur economies of rural areas and also mitigate climate change. Sixteen sweet sorghum varieties namely: Madhura, Theis, Rema, Ramanda, Rio, CMSXS633, CMSXS644, SPV1411, IESV91018LT, IESV92008DL, IESV92038/2SH, IESV93042SH, were planted at the Jomo Kenyatta University of Agriculture and Technology research farm. Rio sweet sorghum with the highest sucrose purity was harvested and juice extracted. SSB was dried, comminuted and pretreated with phosphoric acid and alkaline hydrogen peroxide. The pretreatment with alkaline hydrogen peroxide and phosphoric acid led to 63.40% (wt/wt) and 49.12% (wt/wt) yield of glucose per gram substrate. Hydrolysis was by cellulase produced by Trichoderm reesei and the % theoretical enzymatic sugar yield after 72h was 50%, 78% and 88% for untreated, phosphoric acid pretreated and sodium hydroxide pretreated bagasse, respectively. Fermentation was by baker's yeast and the results were 15.33%, 40.45% and 59.44% of the theoretical yield for untreated, sodium hydroxide pretreated and phosphoric acid pretreated bagasse, respectively. The rate of ethanol production was respectively, 0.001g/l.h, 0.016g/l.h and 0.019g/l.h for the untreated, phosphoric acid pretreated and NaOH pretreated bagasse. Therefore, bioethanol can be produced from SSB but further research should be done to increase the yield before piloting and later commercialization of the process.

Keywords: Rio sweet sorghum bagasse, pretreatment, hydrolysis, fermentation, bioethanol
International Journal of Science and Technology.(3) 4: pp 174-180.(2015).
See more at*: http://www.theijst.com/wp-content/uploads/2015/05/28.-ST1412-035-updated.pdf*