

Bioethanol Production from Wild Sorghum (*Sorghum arundinaceum*) and Spear Grass (*Heteropogon contortus*)

Authors : Adeyinka Adesanya, Isaac Bamgboye

Abstract : There is a growing need to develop the processes to produce renewable fuels and chemicals due to the economic, political, and environmental concerns associated with fossil fuels. Lignocellulosic biomass is an excellent renewable feedstock because it is both abundant and inexpensive. This project aims at producing bioethanol from lignocellulosic plants (*Sorghum Arundinaceum* and *Heteropogon Contortus*) by biochemical means, computing the energy audit of the process and determining the fuel properties of the produced ethanol. Acid pretreatment (0.5% H₂SO₄ solution) and enzymatic hydrolysis (using malted barley as enzyme source) were employed. The ethanol yield of wild sorghum was found to be 20% while that of spear grass was 15%. The fuel properties of the bioethanol from wild sorghum are 1.227 centipoise for viscosity, 1.10 g/cm³ for density, 0.90 for specific gravity, 78 °C for boiling point and the cloud point was found to be below -30 °C. That of spear grass was 1.206 centipoise for viscosity, 0.93 g/cm³ for density 1.08 specific gravity, 78 °C for boiling point and the cloud point was also found to be below -30 °C. The energy audit shows that about 64 % of the total energy was used up during pretreatment, while product recovery which was done manually demanded about 31 % of the total energy. Enzymatic hydrolysis, fermentation, and distillation total energy input were 1.95 %, 1.49 % and 1.04 % respectively, the alcoholometric strength of bioethanol from wild sorghum was found to be 47 % and the alcoholometric strength of bioethanol from spear grass was 72 %. Also, the energy efficiency of the bioethanol production for both grasses was 3.85 %.

Keywords : lignocellulosic biomass, wild sorghum, spear grass, biochemical conversion

Conference Title : ICAE 2017 : International Conference on Agricultural Engineering

Conference Location : Montreal, Canada

Conference Dates : May 11-12, 2017