POTENTIAL OF FUEL ETHANOL PRODUCTION FROM MAIZE STALKS IN KENYA

By

Lucy K. Mwangi[1], Thomas F.N. Thoruwa[1] and Eliud.N.M. Njagi[2]

1. Department of Energy Engineering, Kenyatta University, P. O. Box 43844-0100, Nairobi, Kenya
2. Dept. of Biochemistry, Kenyatta University P. O. Box 43844-0100, Nairobi, Kenya.

The escalating cost of importing foreign oil prompted the Kenya government to promote the production of ethanol from sugarcane for blending with petrol in the early 1970s. Due the rising farm inputs and low global petroleum prices, ethanol production from sugar cane venture in Kenya collapsed in the early 1990's. Other materials widely used for ethanol production include wheat, barley, yellow corn and cassava but their use poses a threat to food security. Kenya maize stalks are known to contain rich sugar juice and most children in the rural areas tend to eat them. Therefore, this study was initiated to investigate the potential of using locally grown maize stalks for fuel ethanol production at different stages of growth in Kenya. About 16 maize stalk varieties were investigated. The Juice was extracted from maize stalks using a manual sugarcane-crushing machine. The juices from various stalks were analyzed for total sugars using a digital refractometer and while specific sugars were analyzed using high performance liquid chromatography (HPLC) with a reverse phase column. Also measured include refractive index detector (RID). The extracted juices were then fermented using bakers yeast (*Saccharomyces cerevisiae*) at standard temperature of 27^{0}C and a pH ranging from 4-5. The mixture was then distilled at 78 ^{0}C and alcohol yields for various varieties of maize stalks were determined. The experiments were repeated three times for 16 Kenya maize varieties at the maize silking stage, maize greening stage and maize harvesting stage. It was found out that there were not significant variations for juice yield produced between the silking and green maize stages. However, the juice yield was found reduced significantly at the harvesting stage with the lowest being 613 liters/ha for Katumani harvesting stage and the highest being 18854 liters/ha for HB625 green maize stage. The two varieties yielded the lowest and highest ethanol of 89 l/ha. and 1244 l/ha respectively. The sugars identified in the maize stalks juice include fructose, glucose and sucrose with the sugar levels ranging between 9%Brix and 15%Brix. It was concluded that the Kenya's maize stalks have great potential for production of ethanol and also provide as an alternate source for fuel for transport and domestic cooking applications.

Corresponding author: Dr. Thomas Thoruwa, E-mail: tthoruwa@gmail.com, thoruwa@yahoo.com