

Review of the Suitability of Water Hyacinth as Feedstock for Bio-energy Production

Christian Nabora, Emmanuel Waweru and Thomas Kivevele

Department of Materials and Energy Science and Engineering (MESE), Nelson Mandela African Institution of Science and Technology (NM-AIST),

P. O. Box 447, Arusha - Tanzania

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Abstract

Energy is a fundamental tool for improving living standard, raising socioeconomic wellbeing and poverty reduction. Depletion of fossil fuels and the environment consequences resulted from their byproducts during combustion drives the need to look for alternative energy sources such as biofuels. Biofuels are bio-based fuels derived from abundant biomass sources. Production of biofuels using edible part of biomass as material for energy production results into food insecurity and uneconomical energy source. Alternatively, nonfood biomass are abundant, cheap, renewable source and do not compete with food chain, hence secured energy source.

Water hyacinth is an aquatic fresh water plant that colonizes water bodies with number of pros and cons to both water bodies and users. It causes serious harms and has an adverse effect on water resources by imposing practical problems for marine transportation, fishing and blockage of water intakes for hydropower and irrigation schemes. Also, it reduces light and oxygen in the water, changes the chemistry of water, affects flora and fauna lives, increases water loss through trans-evaporation and threat to biodiversity. However, the plant is composed of high amounts of hemicellulose (49%), moderate cellulose of about 28 % and low lignin (10 %), it is regarded as ideal feedstocks for biofuel production. In addition, water hyacinths represent a promising organism for fuel production due to their high availability and high biomass yield. Various biofuels have been produced from water hyacinth such as direct combustion, biogas, biodiesel, bioethanol, bioethanol gel, bio chars and other non-energy potential uses.

In controlling the weed, various methods such as chemical, biological and mechanical methods have been applied to eradicate the weed. Very little success has been realized due to high cost. Hence harvesting and transforming it to energy, will boost eradicating process

which results into economic, social, and environmental benefits. Therefore, in this paper, we comprehensively review the studies reported in bio-energy production from water hyacinth. It presents an overview of water hyacinth composition, types of biofuels produced from water hyacinth, techno-economic feasibility of producing the biofuels and challenges. Non-energy applications of water hyacinth have also been reviewed and reported in this paper.