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Water hyacinth as a biomass: A review

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ABSTRACT

Worldwide available, attractive, and invasive biomass as water hyacinth and its characteristic has been discussed in this review. Water hyacinth biomass, as well as its production, characterization and applications, are specifically analysed. The basic principles for the conversion of biomass into biochar via physiochemical processes as well as their usability with catalyst are also elaborated which enhance their quality of products. Water hyacinth has been gained much attention in biochar production, biomethane, biohydrogen, biogas, and utilisation in case of wastewater treatment. Even more focused consideration is still needed to develop integrated decentralized water systems and production of the most valuable and qualitative products like biochar used in power generation. They can be used for various purposes in soil amendment, pollution abatement, carbon dioxide sequestration, CO_2 capture etc. Economic analysis should be done for the profitability of the process.

1. Introduction

The scientific name of popularly Water hyacinth (WH) is *Eichhornia crassipes,* considered as world's most noxious, dreadful, and aquatic invasive weeds produced 14×10^7 daughter plants yearly; cover water area of 1.4 km^2 with an amount of fresh biomass containing 28×10^3 t (Ruan et al., 2016). It causes severe problems like chaos flooding due to blockage in water bodies (Malik, 2007). It severely affects livelihood due to decrease of the fish population at various fish sites (Tellez et al., 2008), recreation, navigation (Chuang et al., 2011), irrigation systems clogging, sedimentation (Zhao et al., 2016). The drastic changes occurred as an ecological and economic disaster (Villamagna and Murphy 2010), imparts decrement in biodiversity (Plaza et al., 2010), and causes various diseases like malaria, filariasis (Mcbeath et al., 2014), dengue, and encephalitis for human beings due to development of abundance number of mosquitos and snails in low oxygen conditions over WH mat regions (Mironga, 2004).

The conventional methods (Hamelinck et al., 2005) are considered as regular removal of biomass from water bodies physically as well as mechanically (Bordoloi et al., 2018). Various control method such as physical (Ram and Moolani; 2000), chemical (Hamelinck et al., 2005), and biological etc. has been suggested for WH control is still under progress for complete removal of invasive weeds growth (Shabana and Mohamed, 2005). As an alternative energy source, WH biomass (lignocellulosic biomass) can be used efficiently due to its abundant availability at low cost, sustainable for waste management, economic, ecology, energy, and society (Bhattacharya et al., 2016). It is used as a potential feedstock for fertilizers, biofuels (Rahman, 2018), biochar (Masto, 2013), ethanol, natural gas, methane (Kalhorinia et al., 2013), xylitol, biogas as well as compost production but mostly in recent trends biochar production is a more focused and profitable path for the use of invasive WH (Bordoloi et al., 2019).

The assistance of long-term carbon emissions sequestration is well managed with biochar obtained from the conversion of WH

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