Development of Bioethanol from Water Hyacinth (*Eichhornia crassipes*) Using Cellulose Degrading Microbial Biofilm

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Water hyacinth (*Eichhornia crassipes*), a persistent and invasive weed found in Sri Lanka that creates numerous problems to aquatic ecosystems. However, it is a promising candidate for bioethanol production due to its abundant availability, low cost and high yield. Currently, usage of lignocellulosic biomass is sustainable alternative to support the global demand for fossil fuels. Still, the conversion of cellulosic material to fermentable sugar is a rate-limiting step due to its highly resistant nature. Therefore, this study was focused to evaluate the efficiency of production of bioethanol from water hyacinth using cellulose degrading microbial biofilms. Microorganisms were isolated form soil sample obtained from a coir retting land in Kurunegala district and were inoculated on Carboxy Methyl Cellulose Agar to screen the most effective cellulolytic fungi and bacteria. One fungal (F2) and two bacterial isolates (B1, B3) were selected based on the cellulolytic activity. Biofilms were developed from the selected fungi and bacteria based on the high cellulolytic activity. The efficiency of the cellulolytic activity by the biofilms were evaluated using 3, 5 DNS assay. The selected biofilms were combined with 2 g of acid pre-treated water hyacinth and were kept nine days at room temperature for fermentation. *Saccharomyces cerevisae* served as the control. Bioethanol production was estimated by dichromate method and confirmed by FTIR analysis. Out of selected biofilms, F2B3 biofilm showed significantly higher bioethanol production (62.85 ppm, $P < 0.05$) than *Saccharomyces cerevisae* (59.81 ppm) after nine days' of fermentation. Further, the yield of bioethanol obtained by F2B3 biofilm and *Saccharomyces cerevisae* from water hyacinth were 0.037% and 0.032% respectively. Therefore, there is a prospect to enhance the bioethanol production from water hyacinth using the effective biofilms.

Keywords: Bioethanol, Water hyacinth, Biofilm