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Efficient Microorganisms for Bioethanol Production from the Natural Environment of Sri Lanka

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Sri Lanka is biologically diverse. The potential of utilizing this rich biodiversity for sustainable socio-economic development of the country is extensive. The vast microbial diversity is a key component in biological diversity. However, the industrial scale application of native microorganisms is still underutilized. The objective of this study was to explore microbial flora of Sri Lanka to isolate efficient cellulolytic fungi and ethanologenic yeast for application in bioethanol production. Fifty fungi were isolated from soil. The total cellulase activity of fungal isolates was determined to compare cellulase production. Yeasts were isolated from local fruits *viz:* grapes, oranges and mangoes. Ethanol production by each yeast isolate was assessed in a glucose containing fermentation medium. Detection and quantification of ethanol were done by High Performance Liquid Chromatography (HPLC) using ethanol standards. The HPLC analysis was conducted using Milli-Q water in 0.6 ml/minute flow rate as the solvent. Hi-Plex H, 300×7.7 mm column was used with Refractive Index Detector for ethanol detection. Both were maintained at 55 °C temperature for the analysis. According to the results, the highest total cellulase activities were given by fungal genera *Trichoderma, Aspergillus* and *Penicillium. Trichoderma viridae* was the most efficient isolate giving a total cellulase activity of 0.574 FPU/ml followed by the *Aspergillus niger*, being the second most efficient cellulase producer with 0.464 FPU/ml total cellulase activity. Total cellulase activity of *Penicillium oxallicum* was, 0.438 FPU/ml, which was not significantly different from *A. niger*. Among six ethanologenic yeast, the highest ethanol concentration was given by Y3 isolate as 9.651% while Y5 showed 5.84 %. All the isolates reported ethanol yields above 2%. There is a great potential of applying these efficient isolates in bioethanol production because cellulolytic fungi can degrade cellulose to release fermentable sugars for yeast.

Keywords: Cellulolytic fungi, Cellulase activity, Ethanologenic yeast