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Efficient ethanogenic yeast isolates for potential application in bioethanol production

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Yeast plays an essential role in bioethanol production as sugar fermenters. As all yeasts are not efficient ethanol producers, evaluation of yeast for ethanol production ability is essential if novel yeast varieties are to be used in the production of ethanol. The aim of the current study was to choose efficient ethanogenic yeast isolates by assessment of their ethanol production, utilizing different glucose and xylose combinations. Yeasts were isolated from fruits including orange, mango and grapes. The microscopic observation of oval shape budding cells in stained smears was a preliminary confirmation of the isolates to be yeast. In order to facilitate the ethanol production, the isolates were aerobically incubated in a standard ethanol production medium for 24 hr followed by 24 hr of anaerobic incubation. The ethanol detection was done by High-Performance Liquid Chromatographic (HPLC) analysis using an ethanol standard series of 1-30%. The concentrations of ethanol produced were compared among the tested yeast varieties. The retention time for ethanol was approximately 21 min. Most of the yeast isolates were found to be ethanogenic yeast producing an ethanol concentration of more than 1%, while the highest amounts of ethanol were exhibited by isolates Y1, Y3 and Y20. The highest ethanol concentration, which was 9.65%, was yielded by Y3 fermenting glucose: xylose at a 2:1 ratio. The other ratios of glucose: xylose were 1:1, 1:2, 1:0 and 0:1. The ethanol concentrations given at those ratios were below 3%. Y1 showed an ethanol yield above 4.5% at each sugar combination tested, while the highest yield of 5.8% was obtained when glucose was the sole source of sugar, indicating different sugar utilizing patterns of yeast. When xylose was the sole source of sugar, the yield of ethanol given by each isolate was negligible, indicating that all the yeast isolates investigated maybe non-xylose fermenting yeast. Furthermore, an overall reduction in the yield of ethanol was observed when xylose was added into the medium. The current study concludes the identification of three efficient ethanogenic yeasts (Y1, Y3 and Y20) under the conditions of investigation, which could be further developed for future industrial application.

Keywords: Bioethanol, ethanogenic yeast, ethanol yield, non-ethanogenic yeast