Abstract

Biofuel from microorganisms

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Most energy comes from burning fossil fuels such as coal and petroleum. The combustion of these fossil fuels generates a high concentration of carbon dioxide in the atmosphere, leading to global warming. Moreover, the supply of fossil fuels is dwindling and they are non-renewable sources. Hence, this project aims to address this problem by fermenting sugar to ethanol by using wastes such as fruit peels and sugarcane bagasse as a source of sugar for the growth of the bacterium *Zymomonas mobilis*. Two methods of ethanol fermentation were explored, namely, ethanol fermentation by free and immobilized cells. Orange peel gave the highest yield of ethanol, followed by sugarcane bagasse and watermelon peel for free *Z. mobilis* cells, corresponding to the concentration of reducing sugars in these wastes. For immobilized *Z. mobilis* cells, a different batch of waste was used, and sugarcane bagasse gave the highest yield of ethanol, followed by orange and watermelon peels. To further increase the ethanol yield, cellulase was added to hydrolyse the cellulose in sugarcane bagasse. There was a higher reducing sugar and ethanol yield after cellulase treatment. The efficiency of ethanol fermentation was comparable with that of the yeast *S. cerevisiae*. The findings of this study can be applied in the scale-up of production of biofuel from wastes, which are renewable and highly abundant, thus saving costs by recycling these wastes. This also helps to alleviate environmental problems such as the excessive release of greenhouse gases from combustion of non-renewable fossil fuels.