Production of Biofuel from Waste of Traditional Thai Vermicelli Production Plant

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Abstract

A research was aimed to produce bioethanol derived from waste of Traditional Thai Vermicelli by investigation of hydrolysis process of the waste at the concentration of 20% using 5% sulfuric acid and enzyme. It revealed that its reducing sugar content derived by 5%sulfuric acid digestion was higher than by α-amylase degradation method or was equivalent to 497.91 ± 0.69 g/ml. The optimization condition of ethanol fermentation by sulfuric acid digestion was carried out by using Box-Behnken Design (Design-Expert®-related application software) and was further fermented by 10% starter of *Saccharomyces cerevisiae* TISTR 5339 and prediction of proper parameters related to bioethanol fermentation from waste of Traditional Thai vermicelli production plant by Response Surface Methodology (RSM) using Design Expert® software. It was clearly demonstrated that optimized condition of bioethanol production was no supplementation of ammonium sulfate as nitrogen source into fermentation broth prior to yeast fermentation was carried out but it required to adjust its initial pH to be 4.5 before the fermentation and temperature control throughout fermentation process was $32.5^{\circ}C$ (in practice, temperature should be adjusted to be $33^{\circ}C$) with maximum ethanol concentration of 8.27% for 8 days' fermentation. However, on the large scale of fermentation (18 liter), the fermentation process should be performance into fed-batch fermentation and fermentation time should be extended to 30 days. After 40 Liter waste of traditional Thai vermicelli production plant was fermented yeast starter, he distillation process was begun, its final volume of distilled ethanol was 2.295-liter which concentration was $92.50 \pm 0.71\%$. The final yield of distilled ethanol per the initial of Thai Rice Vermicelli Waste Starch volume was 5.74. Finally, the production of biofuel (gasohol) by mixing the purified ethanol with 91 octane number gasoline oil, its final volume was 7.80-liter and could be successfully used as fuel for small engine.

Key words: Thai Rice Vermicelli Waste Starch, Ethanol, Sulfuric Acid, Box-Behnken Design, Response Surface Methodology, Gasohol

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