PRODUCTION AND QUALITY EVALUATION OF BIOETHANOL FROM CORN (*Zea mays* L.)

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2019

ABSTRACT

Industrialization and world population are continuously increasing and this demands high energy. As a result, the cost of crude oil, coal, and natural gas is increasing from time to time. Awareness of global climate change and the uncertainty of fossil fuel have thus led to the development of renewable energy. Biofuels are the renewable energy that gets attention these days. Bioethanol, biodiesel, and biogas are the dominant renewable energy among biofuels. Although a number of biofuels are available bioethanol is the most commonly used renewable fuel in the transportation sector. Bioethanol is the product of the sugar fermentation process from carbohydrate (sugar or starch) sources. Corn is the most important and economical source of starch, comprising about 68-72% of kernel weight, which is easily converted into glucose and fermented into ethanol. This present study was designed to produce bioethanol from corn grains.

Bioethanol was made from corn mash in the different concentration of 10%, 20%, 30% and 40%. Corn mash was subjected to hydrolysis and fermentation by the addition of amylase enzyme and yeast at the amounts of 2ml and 5ml respectively. Different concentration of fermented ethanol was separated from the sample by distillation. Distillated samples were subjected to several physico-chemical analysis to evaluate the suitability of corn mash for the peak production of ethanol. Determination of ethanol content by both specific gravity method and spectrophotometer technique revealed that at 30% of mash content peak ethanol productivity was observed. Compared to specific gravity method, spectrophotometric process for ethanol determination was more

trustworthy and the amount of ethanol produced was 13.63% and 13.8% by the both techniques respectively.

Results of the physico-chemical analysis revealed that the titratable acidity was increased gradually up to treatment 3 and suddenly dropped at treatment 4. Treatment 1 had the least mean value (0.51%) and treatment 3 had the highest mean value (0.74%); pH and electrical conductivity measurements had the least mean value for the treatment 3 and highest mean value was obtained from treatment 1. The amounts of total soluble solids, reducing sugar and total sugar were increased with the increase in mash concentration. The results of physico-chemical analysis showed that, there were significant differences ($p<0.05$) between the treatments. Total soluble solids were decreased for all treatments from the initial (before fermentation) to after the fermentation. The results were obtained higher at 40% of mash content after fermentation which was 13.4°Brix and the least mean value (obtained from 10% of mash) was 2.2°Brix. The results indicated that, the ethanol obtained from the 30% mash, contained 13.8% of ethanol and within the distilled ethanol sample; 0.74% of acidity (as acetic acid), pH of 3.76, 36.67µs/cm electrical conductivity, 10.17°Brix total soluble solids, 0.54% reducing sugar and 8.89% of total sugar were observed.

TABLE OF CONTENTS