Production of Glucose Syrup by Enzymatic Hydrolysis of Waste Coconut Gel

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Abstract :

The production of glucose syrup from waste coconut gel as a raw material using enzymatic hydrolysis was investigated. In the hydrolysis experiment, the variable effects on reaction time and the ratio of dried waste coconut gel weight to volume of acetate buffer solution were studied. The results showed that the highest percentage recovery of glucose obtained at 24 h of hydrolysis time and 1:20 of weigh to volume ratio of dried waste coconut gel and acetate buffer solution. This condition gave 90.53% of glucose recovery.

Introduction:

One coconut factory in Thailand produced coconut gel by using *Acetobacter xylinum*. The *Acetobacter xylinum* was added into coconut juice to produce coconut gel. After the process finished, coconut gel separated into two layers. The lower waste coconut gel and upper waste coconut gel were separated. This process resulted in waste coconut gel waste around 200-300 kg/day. So, the factory want to make a value added product of this waste by producing glucose syrup as a new product or reuse it as a carbon source in another fermentation process of factory. The value added product not only solve the environmental problem from its smell but also increase the income of this factory, too.

From literature review, coconut gel was cellulose could that called bacteria cellulose. The bacteria cellulose could produce by acetobater xylinum bacteria that change fructose sugar in coconut water into bacteria cellulose. Bactoria cellulose contained around 300 glucose molecule as monomer linked together by β-1,4-glycosidic linkage (Shibazaki, 1995). Production of glucose syrup from bacteria cellulose can be succeeded by hydrolysis with inorganic acid such as sulfuric acid, hydrochloric acid or enzyme as catalyst.

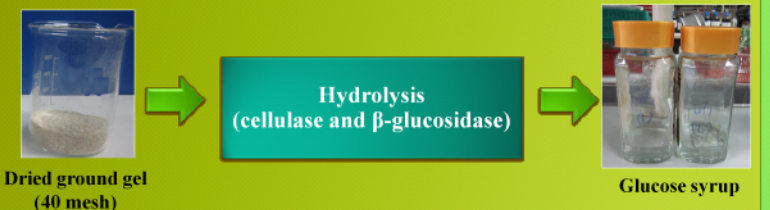
Enzymatic hydrolysis of cellulose is carried out by cellulase enzymes, which are highly specific. Products of the hydrolysis are usually reducing sugar such as glucose. This method has many advantages compared to chemical hydrolysis such as low utility cost, higher sugar yields, and no corrosion problem (Sun, 2002).

The objective of this research was to study and optimize the production of glucose syrup through the enzymatic hydrolysis of waste coconut gel. Effects of reaction time and the ratio (w/v) of dried waste coconut gel to acetate buffer solution were investigated.

Materials and Methods

Raw material preparation

Enzymatic hydrolysis



$$Glucose\ recovery(\%) = \frac{Amount\ of\ glucose\ obtained\ after\ hydrolysis}{Amount\ of\ glucose\ in\ dried\ groung\ gel} \times 100$$

Results and Discussion :

Table 1: Effect of time on hydrolysis of coconut gel waste

Time (h)	12	24	48	72
Glucose content (g/100g)	32.00	38.64	38.64	34.00

Table 1, it indicated that the optimum hydrolysis time at 24 h gave 38.64 g of glucose per 100 g of dried waste coconut gel. After that, the further experiment in weight to volume ratio of dried waste coconut gel and acetate buffer solution was studied. The result was shown in Table 2.

Table 2: Effect of weight to volume ration hydrolysis of waste coconut gel

Weight to volume ratio	1:20	1:25	1:30
Glucose content (g/100g)	38.64	25.02	18.37

Table 2 showed that 1:20 of weight to volume ratio of dried coconut gel and acetate buffer produced the highest content of glucose. Thus, this ratio was the optimum ratio for enzymatic hydrolysis. In addition, the percentage of glucose recovery was calculated from glucose content (38.64 g/100 g) obtained from Table 2 and glucose content (45.68 g/100 g) obtained from dried coconut gel. The calculation gave 90.53% of glucose recovery.

Conclusions :

In this research, dried waste coconut gel can be used as raw material for glucose syrup production. The optimum condition for maximum glucose recovery was 90.53% at 24 h and 1:20 of weight to volume ratio of dried waste coconut gel and acetate buffer solution..

References :

Shibazaki, H., Kuga, S., Onabe, F. (1995) Acid hydrolysis behaviour of microbial cellulase II. Polymer 36 (20) : 4971-4976.

Sun, Y., Cheng, J. (2002) Hydrolysis of lignocellulosic materials for ethanol production: a review. Bioresource Technology 83 (1): 1-11.

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