

# Isolation of prebiotic inulin from Gadung Aceh tuber (*Dioscorea Hispida*) using hydrolysis reaction

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**Abstract.** The goal of this research to identify inulin compounds in Aceh gadung tuber (*Dioscorea Hispida*) by using hydrolysis method with variations hydrolysis time 30 minutes; 60 minutes; 90 minutes and hydrolysis temperature 70°C; 80°C. Inulin is a group of carbohydrate that are prebiotic. Inulin is usually use a substitute for fat and sugar in low calorie food product. The hydrolysis method used can convert the carbohydrate from tuber starch to glucose and also convert it to simple sugar that is fructan. The analysis in this research is detected inulin function group by analysis Fourier Transform Infrared Spectroscopy (FTIR) and yield of crystal inulin. Isolation inulin used material and solvent (1:5) can obtained the best treatment of isolation inulin is operating condition at hydrolysis temperature 70°C by hydrolysis time 60 minutes, in this condition the yield of crystal inulin is 42%.

## 1. Introduction

The tendency of dietary habit that is generally high in calories and low in fibre is the reason for various observations regarding the potential content of inulin in various types of plants. Insulin is a group of carbohydrates that contain high fibre and are prebiotic. These properties provide many benefits for health. Inulin also has a lot of potential in the food industry which can be used as a substitute for fat and sugar in low-calorie food products. The addition of prebiotics in food additives has been carried out. This is due to the ability of prebiotics to stimulate growth and activity of good bacteria in the intestine. Inulin cannot be digested by digestive enzymes, but is fermented by colon microflora (large intestine). Therefore inulin functions as a beneficial substrate of the microflora in the intestine. Inulin is a polysaccharide, including a carbohydrate called fructan and is a polymer containing a fructose group with  $\beta$ -2,1 fructofuranside bonds. Inulin is a type of fructan or polymeric fructose (a combined chain of fructose monomers) which mostly contains about 35 fructose units that are connected to each other in a straight chain by binding to  $\beta$ -2.1 glycosides. This research is a development regarding prebiotic sources, one of which is inulin from Aceh Gadung tuber. Gadung bulbs have high carbohydrate levels where carbohydrates are a source of inulin. Gadung Aceh tuber have a high carbohydrate and calorie content, carbohydrate content is 23,5 gram or about 18%. Starch carbohydrates will turn into maltose and turn into glucose, then glucose will turn into the simplest sugar, namely fructan. Where inulin is one type of fructan or contains a fructose group. In this research, an optimization approach to the isolation process of inulin will be carried out in Aceh gadung tubers through hydrolysis reactions by developing process variables that have been done previously. The purpose of this research to identify the content of inulin in the gadung tuber of Aceh (*Dioscorea Hispida*) through the hydrolysis method with variations in the process variable hydrolysis time and

hydrolysis temperature. In addition, the purpose of this study is to determine the effect of hydrolysis temperature and hydrolysis time on yield of inulin crystals.

## **2. Material and Method**

### **2.1 Raw Material and Equipment**

Raw Material and Equipment The raw material in this study is Aceh Gadung tuber (*Dioscorea hispida*). Water as a solvent. Additional ingredients for the inulin binding process are maltodextrin, egg white. The equipment in this study are water bath, blender, pumpkin, spiral condenser, reactor thermometer, filter paper, funnel, Erlenmeyer, beaker glass, measuring cup, centrifugation device.

### **2.2 Inulin Isolation Process from Gadung Aceh Tuber**

Inulin Isolation Process from Aceh Gadung Bulbs Prepare Aceh gadung tubers which have been sorted and then stripped, washed, and reduced in size. Then the ingredients are weighed as much as 100 grams, and smoothed with the addition of water 1: 5. And hydrolysed at 70°C; 80°C for 30 minutes; 60 minutes; 90 minutes. Then filtered and extracted the filtrate. The resulting filtrate is added with 96% ethanol as much as 40% of the filtrate volume. Then deposited for 24 hours; 36 hours; 48 hours. Then thawing is done at room temperature  $\pm$  2 hours. Then centrifuged at 1500 rpm for 15 minutes. Then white sediment is obtained, and dried at 50-60°C. The inulin deposit produced is carried out by the binding process.



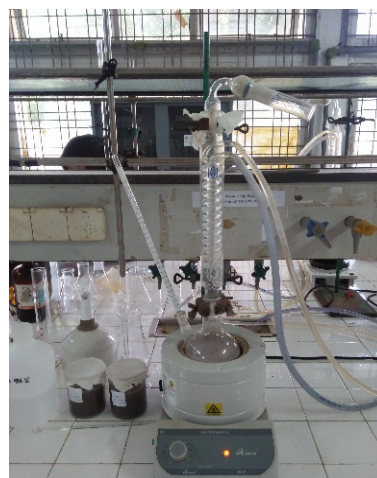
**Figure 1.** Gadung Aceh Tuber (*DioscoreaHispida*)



**Figure 2.** Size reduction of Gadung Aceh tuber



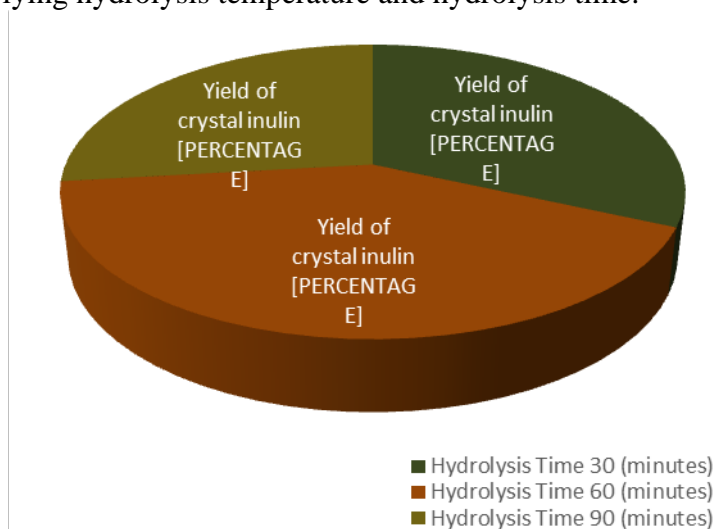
**Figure 3.** Preparation of material to be hydrolysed



**Figure 4.** Operating Condition of Hydrolysis Inulin

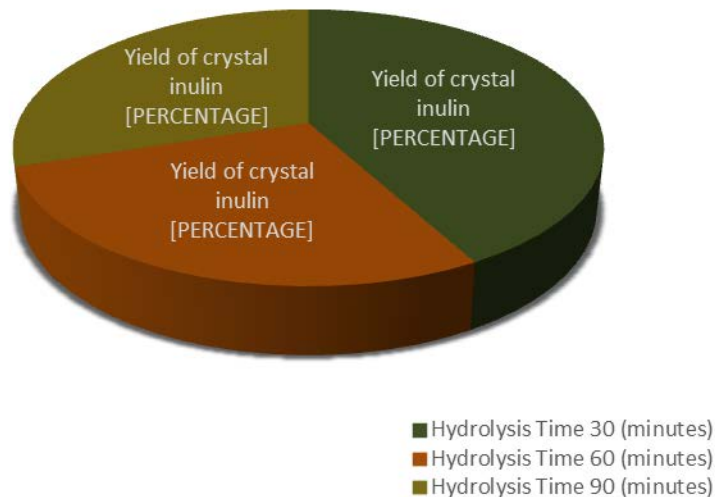
### 3. Result and Discussion

The hydrolysis process in this study to break carbohydrates from starch into simple sugar compounds by varying hydrolysis temperature and hydrolysis time.



**Figure 4.** The influence of hydrolysis temperature (70°C) to yield of inulin crystal

From Figure 4, we can see that increases hydrolysis time or temperature give effect to yield crystal inulin. The hydrolysis temperature is related to the reaction rate. The higher hydrolysis temperature, the hydrolysis time will take place faster. Because the reaction rate constant increases with increasing operating temperature, which further increases the conversion reached to optimum point. Therefore, the addition of temperature will further reduce the levels of inulin produced because it has passed its optimum point. The highest yield of crystal inulin is 41% with hydrolysis temperature 70°C. And the lowest yield is 27% with the longest hydrolysis time. Effect of variations hydrolysis temperature and hydrolysis time is different to yield crystal inulin product.



**Figure 5.** The influence of hydrolysis temperature (80°C) to yield of inulin crystal

From Figure 5, we can see that pada figure above show that the fastest hydrolysis time increasing the yield of inulin crystal with hydrolysis temperature 80°C. The highest yield of inulin crystal is 42% with the fastest hydrolysis time. The lowest yield of inulin crystal is 2,80% with hydrolysis time 60 minutes. And while the longest hydrolysis time is produced 30% yield of inulin crystal. Variations hydrolysis temperature and hydrolysis time give effect to yield crystal inulin product.



**Figure 6.**Yield of crystal inulin product

#### 4. Conclusion

The crystal inulin of gadung Aceh tuber can be obtained optimally at hydrolysis temperature 70°C and get the highest yield of crystal inulin produced is 42%. And physical characteristics are black powder color, and texture like crystal.

## References

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