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The Utilization of Cellulose Durian Peel (*Durio Zibethinus*) for Synthesis of CMC (Carboxymethyl Cellulose)

Rr. Dewi Artanti Putri[1] and Zenny Kurniyati[2]
[1,2]Department of Chemical Engineering, Engineering Faculty, Unnes, Semarang 50229, Indonesia
dewi.artanti@yahoo.com[1]

***Abstract*—Durian peel is part of the durian approximately 60-75% underused and potentially become a waste. Durian peel contains a substance that is composed of cellulose as high as 50-60%, about 5% lignin and starch were lower by about 5%. Cellulose durian peel is a potential source of alternative raw materials manufacture of carboxymethyl cellulose (CMC) instead of wood. This study aims to determine the yield of cellulose from durian peel with NaOH solution variations in the isolation process and determine the yield of CMC produced with sodium chloroacetic variations in the synthesis process. Results cellulose insulation durian peel using NaOH with a ratio of durian peel and NaOH 10% (w / v) at 1:10, 1:15 and 1:20 is 27.18%; 64.72% and 30.84% respectively. CMC yield on varying the amount of sodium chloroacetic as many as 5, 6, 7, 8, 9 grams is 66.44%; 40.19%; 24.83%; 66.72%; 45.21% sequentially.**

Keywords*—Durian peel, carboxymethyl cellulose, sodium chloroacetic

I. INTRODUCTION

Durian is produced in Indonesia and spread across several districts or cities. Based on data from the Directorate General of Horticulture, in 2012 the production of durian crops in Indonesia reached 888 127 tonnes. This number is expected to continue to grow given the market demand for up to twenty years into the future is still promising. With the figure reaching nearly 900 thousand tons, durian also have the potential to produce waste in the form of peel which reached 60-75% of the total weight of the fruit (Untung, 2008). During this time, part of the more common durian fruit consumption is part coated fruit. The percentage weight of this section including low at only 20-35%. This means the peel (60-75%) and seeds (5-15%) has not been utilized to the maximum (Wahyono, 2009). Based on research, durian peel contains a substance that is composed of high cellulose as high as 50-60%, about 5% lignin and starch were lower by about 5% (Fadli, 2010). Cellulose content in durian peel high enough to have the potential to make durian peel as CMC (carboxymethyl cellulose).

CMC (carboxymethyl cellulose) is a derivative of cellulose and are often used in the food industry. Food additives, CMC (carboxymethyl cellulose) is used as a stabilizer, thickener and emulsifier. Due to a very wide utilization, easy to use, carboxymethyl cellulose into one of the substances of interest in the food industry. Based on these considerations, it takes an effort to produce a CMC from plant cellulose sources are widely available in Indonesia and less utilized optimally as durian peel. Thus the durian leather waste, can reduce environmental pollution and increase state revenues because it can have a high economic value if developed applicative.

II. METHOD

The phase of the research study include sample preparation stage, the process of cellulose insulation, manufacture of CMC (including alkalization stage and karboksimetilasi), and the neutralization process. Durian peel sample preparation starts from the peel cut into pieces, and then dried in the sun to dry. Durian peel dry milled and sieved to 60 mesh sieve. Flour dried durian peel back by using the oven for 1 hour at 60 ° C (Melisa et al, 2014). Durian peel powder obtained is then isolated the cellulose. Durian peel powder soaked with a solution of 10% sodium hydroxide with ratio durian peel porder to solvent 1:10 (w / v), 1:15 (w / v), and 1:20 (w / v), then stirred evenly until the entire powder durian peel perfect submerged. Soaking for 24 hours. After it is filtered using a filter cloth. The residue obtained is then soaked in a solution of hypochlorite (chlorine) 5% for 1.5 hours. Then the mixture is filtered and the resulting residue is washed with distilled water that has been boiled until the odor disappeared hypochlorite. The residue was then put into a petri dish and then dried in an oven with a temperature of 60 ° C to constant weight (Melisa et al, 2014). Extract yield can be calculated by the following equation (1) :

$$Extract\ yield\ (\%) = \frac{dry\ weight\ of\ extract\ durian\ peel}{weight\ of\ durian\ peel\ powder}\ x\ 100\% \quad (1)$$

CMC synthesis done by 5 grams of durian peel extract (cellulose) is then added with 100 ml of distilled water in a 250 ml flat bottom flask. Then added 10 ml of 30% sodium hydroxide solution dropwise. Alkalization process is carried out for 1 hour at 25 ° C on a hotplate fitted shaker. After alkalization completed followed by karboksimetilasi. In this research, various variations of the ammount of sodium chloroacetic (w / w) is added to the above mixture is 5, 6, 7, 8, and 9 grams. The mixture is then heated at a temperature of 60 ° C to 70 ° C for 2 hours, the process is carried out with oilbath Karboksimetilasi. after which the mixture was filtered and the residue obtained in the form of CMC.

After the process carboxymethylation was completed, a neutralization residue obtained, soaked with 100 ml of methanol for 24 hours. Then the mixture was neutralized using a solution of glacial acetic acid. The mixture is then filtered again and the residue dried in an oven with a temperature of 60 ° C until its weight is constant. CMC obtained dried then crushed using a mortar and sieved to 60 mesh sieve. Carboxymethyl cellulose produced is determined (Melisa et al, 2014). Carboxymethyl cellulose yield is determined by the following formula (eq 2) :

$$Crude\ yield\ of\ CMC\ (\%) = \frac{weight\ of\ product\ (CMC)}{weight\ of\ extract\ durian\ peel}\ x\ 100\% \quad (2)$$

III. Result and Discussion

Cellulose insulation is done to separate the cellulose and non-cellulose components such as lignin, hemicellulose, and pectin. On the particle size of the material used will be very influential in the extraction process, which will ultimately increase the amount of lignin and hemicellulose are liberated. This study uses a durian peel with a particle size of 60 mesh, because the smaller the particle samples extracted more and more and the higher the yield of cellulose obtained. The removal of lignin can be done by adding acid or base so that the lignin becomes soluble compounds. Durian peel powder extraction using durian peel powder with a water content of 4.8% and a basic compound, ie 10% NaOH solution with a ratio of durian peel and NaOH 10% (w / v) of 1:10, 1:15, and 1:20 with time soaking for 24 hours to determine the yield of cellulose to be obtained. Durian peel powder extraction result shows that the yield of durian peel extract at a ratio of durian peel and a solution of NaOH 10% (w / v), 1:10 is 27.18%, 64.72% is 1:15, and 1:20 is 30.84%. On these results showed that the use of 15% NaOH solution to get the most yield of cellulose. Research conducted by Bidin (2010) with the same treatment and the different materials that rice straw with a yield of 36.335% and the research conducted by Melisa (2014) is made from sweet corn cob with a yield of 36.165%. Therefore the extraction of cellulose used for the manufacture of CMC uses the ratio of durian peel and a solution of NaOH 10% (w / v) 1:15 with a water content of 4.8% and a yield of 64.72% cellulose as presented in Figure 1. At the 1:10 ratio of cellulose isolated too little because the mixture between the peel of durian and NaOH too thick so as to separate the cellulose and lignin and hemicellulose are still difficult. At a ratio of 1:20 yields down, this happens because too many NaOH were mixed.

Maximum conditions carboxymethyl cellulose synthesis reaction, namely when adding 8 grams of sodium chloroacetic, carboxymethyl cellulose yield obtained at 66.71%. Previous research conducted Melisa (2014) from samples of sweet corn cobs optimum conditions carboxymethyl cellulose synthesis of reaction upon addition of 7 grams of sodium monokloroasetat, carboxymethyl cellulose produced produce yield of 55.79%. When compared with previous studies, CMC yield of durian peel is better, reaching 66.71%. It can be influenced by the type of material used. Durian contains 50-60% cellulose (Fadli, 2010) while corncobs only contain 41% cellulose (Melisa, 2014).

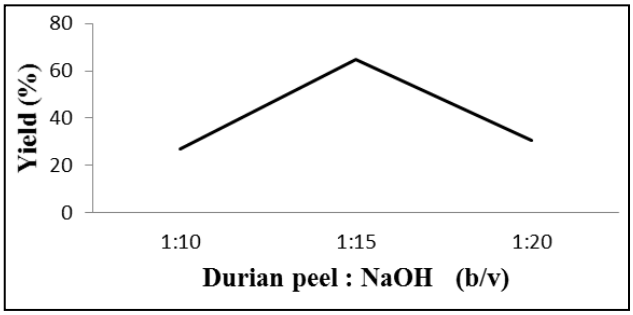

Figure 1. Effect of durian peel Ratio: NaOH to yield of cellulose

TABLE I. Effect of the Amount of Sodium Chloroacetic to the CMC Yield

The amount of sodium chloroacetic (g)	The results of CMC Synthesis (g)	Yield (%)
5	3,32	66,44
6	2.01	40,19
7	1,24	24,83
8	3,34	66,71
9	2,26	45,21

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IV. Conclusion

Durian peel waste can be used as raw material in the manufacture of CMC because they contain a high cellulose. The amount of 10% NaOH solution which produces cellulose greatest yield is as much as 15% (w/v) is 64.72%. The amount of sodium chloroacetic used during the synthesis process CMC CMC influence the amount of yield. The amount of sodium chloroacetic that gives the highest yield is 8 grams which generate as much as 66.71% CMC.

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