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The Effect Of Bromeline Enzymes And The Length Of Time Of Fermentation On Yield And Free Fatty Acids In Palm Oil

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ABSTRACT- Pineapple skin contains enzyme bromelain as much as 0.05 - 0.08%. The presence of the enzyme bromelain can be used as a raw material for making palm oil. The process of making palm oil is carried out enzymatically with the addition of the enzyme bromelain from pineapple peel. Bromelain enzyme is a proteolytic enzyme that can hydrolyze a protein peptide bond which minimizes the use of heat during the oil palm sterilization process. This study aims to determine the concentration of pineapple peel extract that produces optimal yield and the effect of adding pineapple peel extract on the acid number, saponification number and free fatty acids in palm oil. The variables used are the concentration of pineapple peel extract 200 ml, 250 ml, 300 ml and the ripening time is 15, 20, and 25 hours. The oil with the best results was obtained at a pineapple extract concentration of 60% and curing time of 25 hours with a yield of 49.5%, an acid number of 0.282%.

Key words: *Bromelain enzyme, pineapple peel, palm oil.*

INTRODUCTION

According to Whitaker (in Sangi, 2016) pineapple plants contain the bromelain enzyme, which is a proteolytic enzyme that can catalyze the hydrolysis reaction of a protein peptide bond. Other fruit parts such as pineapple stems, skins and stalks also contain the bromelain enzyme.

According to Kambey (in Sangi, 2017) reports that the enzyme content of bromelain in pineapple is found in pineapple fruit with the highest specific activity, namely 62.5 U/mg; while on pineapple stems 27.3 U/mg and pineapple peels 32.2 U/mg. Utilization of pineapple plants is generally limited to pineapple fruit, while pineapple skin is not used by the community and is only disposed of as waste, even though pineapple peel waste contains the bromelain enzyme with a high activity which can be used in palm oil processing.

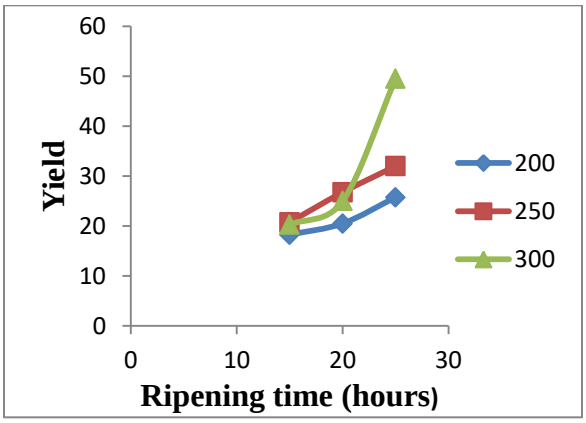
Making palm oil enzymatically using various types of enzymes has generally been done and one of them is the manufacture of palm oil using the enzyme papain from young papaya juice. However, the yield produced was not optimal so yeast was added to produce maximum yield. Therefore, it is necessary to make palm oil using other types of enzymes to produce maximum yield, for example the bromelain enzyme which comes from pineapple juice.

RESEARCH METHODOLOGY

Making Bromelain Enzyme Extract, namely: 1). Pineapple skin is cleaned and cut into small pieces and crushed using a blender with a ratio of 1: 1 with clean water. 2). Pineapple skin that has been blended in the mixture, the extract is collected in a beaker glass. Making cooking oil, namely: 1). Prepare samples of bromelain enzyme extract with variations of 200 ml, 250 ml, 300 ml, each sample was added with 400 ml of CPO and stirred until homogeneous. 2). The ripening process was carried out with a variation of 15 hours, 20 hours, 25 hours with a temperature of 40ºC to form three layers, blondo in the first layer, oil on the second layer, and water on the bottom layer. 3). The separation process uses a separating funnel so that the oil is separated from the water and blondo. 4). Oil refining process is divided in two stages. The first refining stage is neutralization where the oil that has been obtained separated from its fatty acids by the addition of 4 N NaOH with the oil composition: NaOH = 100g: 4ml then heated for 10 minutes at ± 40 ±. Then filtered to separate the dirt. 5). The second stage is bleaching. Enter 100 grams of oil and 7 grams of activated charcoal then heat it for 60 minutes to a temperature of ± 100 ℃. Then filtered to separate the dirt.

RESULTS AND DISCUSSION

Table 1. Analysis of Yield on the Effect of Bromelain Enzyme from Pineapple (Ananas Comusus) Skin and Fermentation Time



Picture 1.Graph of the relationship between the Effect of Bromelin Enzyme Extract from Pineapple (Ananas Comusus) Skin and the Time of Fermentation on Oil Yield

Enzyme Volume	Yield Time Time of Acid Numbers Oil yield (%)		
Enzyme Volume	15 hours	20 hours	25 hours
	Acid Numbers (%)		SNI Standart
200 ml	18,25	20,5	25,75
250 ml	20,75	26,75	32
300 ml	20,25	25	49,5

15 hours 20 hours 25 hours

3741 :2017

Based on the data from the research results, it shows that the sample of 200 ml, 250 ml and 300 ml bromelain enzyme extract, it was found that the highest amount of cooking oil produced from the volume of 300 ml of bromelain enzyme with ripening time for 25 hours was 49.5, the best result. Oil yield with normal state of smell, taste and color. The color is light yellow and clear. This is in accordance with the standard requirements for the quality of cooking oil with SNI 3741: 17. Because the addition of pineapple peel extract has more effect on the amount of the enzyme bromelain (protease) which can break down lipoprotein bonds. The more bromelain enzyme extract is used, the greater amount of oil is produced. While the lowest results were found in the volume of 200 ml of bromelain enzymes with a ripening time of 15 hours, amounting to 18.25 due to the lack of addition of bromelain enzyme extract and the lack of ripening time, the comparison results of previous studies were maximal but not perfect.

In chemical terms it can be written as follows:

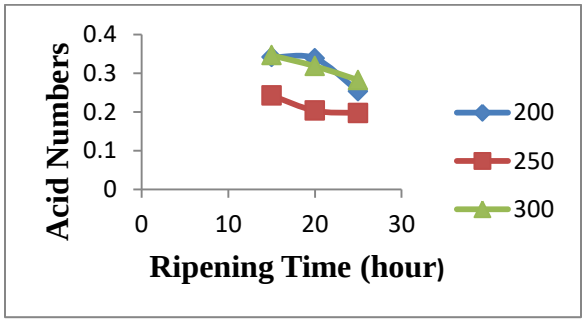
$$C_{14}H_{21}ClN_2O_3S + C_{16}H_{32}O_2C_{17}H_{33}COOH + H_2O$$

(Bromelain Enzyme) + (CPO Oil) $\longrightarrow$ (Cooking Oil) + (Water)

200 ml	0,341	0,338	0,253	Maks : 0,60
250 ml	0,242	0,203	0,197	
300 ml	0,346	0,318	0,282	

Table 2. Analysis of Acid Numbers on the Effect of Bromelain Enzyme Extract from Pineapple Bark (Ananas Comusus) and Ripening Time.

Figure 2.Graph of the relationship between the concentration of Bromelain enzyme extract from pineapple peel (Ananas Comusus) and the duration of fermentation on acid number.



Based on the data from the research results, for the analysis of the acid number on the effect of the bromelain enzyme extract from pineapple peel with a comparison of the volume of the pineapple peel enzyme extract 200 ml, 250 ml and 300 ml and the duration of ripening for 15 hours, 20 hours and 25 hours it can be concluded where cooking oil produced from palm oil processing, with the result of 200 ml enzyme volume at 15 hours obtained 0.341% of the acid number, while the volume of 200 ml of bromelain enzymes at 20 hours was 0.338, and the volume of 200 ml of bromelain enzymes at 25 hours was obtained 0.253% , and the volume of bromelain enzyme 250 ml at 15 hours was 0.242%, while the volume of bromelain enzyme 250 ml at 20 hours was 0.203%, and the volume of bromelain enzyme 250 ml at 25 hours was 0.197% and the volume of bromelain enzyme 300 ml at the time 15 hours obtained 0.346%, while the volume of bromelain enzyme 300 ml at 20 hours was 0.318%, and the volume of bromelain enzyme 300 ml 25 hours was obtained 0, 282%. Shows that the level of the acid number can be used to determine the quality of the cooking oil produced. The higher the acid number, the lower the cooking oil quality. Based on these data, it can be seen that the lowest acid number of 300 ml with a volume of bromelain enzyme for 25 hours yields 0.282%. This has met the Indonesian National Standard (SNI), which is 0.60%. The longer the time and the enzyme concentration, the lower the acid number because the enzyme action to break down lippoproteins into water and oil increases.

The chemical reaction can be written as follows:

$$C_{14}H_{21}CIN_2O_3S \quad + \quad C_{16}H_{32}O_2C_{17}H_{33}COOH \quad + \quad H_2O$$

(Bromelain Enzyme) (CPO Oil) (Cooking Oil) (Water).

CONCLUSION

a. The volume of 300 ml pineapple peel extract gave the highest oil yield with a ripening time of 25 hours, namely 50%.
b. The quality of the cooking oil produced is: an acid number of 0.282%. The addition of pineapple skin extract in palm oil is able to produce cooking oil according to the Indonesian National Standard (SNI) 3741: 2017.

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