

Characterization Red Palm Oil (RPO) Olein Fraction Via Distillation Vacuum

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ABSTRACT: Research has been carried out on the effect of red palm oil quality via vacuum pressure reduction distillation. In the initial stage, the crude palm oil (CPO) was centrifuged at 4000 rpm for 30 minutes to separate the olein and stearin fractions, then the olein fraction was treated to produce red palm oil via the stages of degumming process, neutralization, and a distillation process by reducing vacuum pressure. The use of the vacuum pressure reduction distillation method provides a significant effect in the red palm oil production process. Several parameters were analyzed, such as free fatty acid content, peroxide value, and carotene content, which had a significant effect on the quality of the red palm oil produced. From the results of the study showed that the free fatty acid content was in the range of 0.03 - 0.08%, the peroxide value was 0.11 - 0.15 meq/kg, and the carotene content was 467-586 ppm.

INTRODUCTION

Red Palm Red palm oil (RPO) contains about 1% of minor component including carotene. The nutritionally important components such as carotenes and tocopherols also improve stability of the oil. The carotene content in crude palm oil varies between 500 and 700 ppm [1-2]. Red Palm Oil is obtained through the degumming, neutralization and deodorization processes of CPO. The process stages are carried out at low temperatures which aim to remove free fatty acid levels contained in CPO and to maintain carotene levels so that they are not lost during the deodorization process [3]. One of the characteristics of Red Palm Oil is that it has carotene levels in the range of 200-700 ppm, and free fatty acids <1%. The RPO content is slightly different from CPO even though it has undergone a heating process at a lower temperature and has gone through the degumming, neutralization and deodorization processes, where the levels of carotein and FFA are lower when compared to CPO [4].

Some of the physicochemical properties of RPO which are often used as standards for commercial purposes include carotene content, free fatty acid content, iodine number, peroxide value, odor and color [5]. The use of RPO in industry has been applied to margarine, shortening and cooking oil, as well as several other food products. Therefore diversification of RPO products is very beneficial for increasing the nutrition of red palm oil.

In this study, the stages of the distillation process are very important, considering that so far the cooking oil production process uses very high temperatures in the range of 220-270°C, so that the carotenoid content in the cooking oil will be degraded due to the

influence of heat [6]. Therefore, the pressure reduction vacuum distillation method is an alternative choice in the production of red palm oil, where the temperature range used in the distillation process is in the range of 120-140°C, the distillation time is 1-2 hours so that the carotenoid content can still be maintained.

Distillation under vacuum pressure is a process of separating mixtures into pure fractions. Where the separation of the mixture is determined by the difference in the volatility of the components to be separated. Basically, the volatility of a compound is inversely proportional to its boiling point and its molecular weight. The process that is quite significant in determining is the flow of fractionation column vapor to the bottom of the liquid so that heat exchange occurs. It is hoped that by using the reduced pressure vacuum distillation method, the red oil produced is in accordance with the required standards, so that it can be used as a pilot plan in the production of red palm oil on an industrial scale.

RESULT AND DISCUSSION

The results of the analysis of the quality of red palm oil treated with reduced distillation gave quite significant results as presented in Table 1.

Table 1. Analysis Results and Characteristics of Red Palm Oil Produced

Analysis/Chracteristics	1	2	3
Temperature (°C)	< 100	100-120	120-140
Pressure (atm)	3	3	3
Process Period (hour)	2	2	2
Free Fatty Acid (%)	0.08	0.05	0.03
Peroxide Value (meq/kg)	0.11	0.11	0.15
Carotene (ppm)	586	542	467

Analysis of free fatty acid content is one of the indicators in determining oil quality and is the main parameter in the stages of the oil processing process, where differences in free fatty acid content in the oil after the distillation process indicate that the treatment of temperature and vacuum pressure will affect the quality of the oil produced, besides the effect of distillation will also affect the free fatty acid content and the fatty acid composition of each type of oil. Where is the content of free fatty acids in the distillation process with temperatures below 100°C, 100-120°C and 120-140°C with a range of 0.03-0.08%. These results indicate that the distillation temperature treatment will affect the quality of the red palm oil produced.

Determination of the level of oil degradation is usually carried out by measuring the peroxide value, where the peroxide value is a very significant parameter in determining the quality of the resulting oil product. Where the peroxide value parameter is closely related to the ease with which the oil undergoes oxidation. Therefore, by using reduced pressure distillation, it can be known whether the oil produced is easily oxidized or not. The results showed that the effect of pressure greatly affected the peroxide value, where the peroxide value was in the range of 0.11-0.15 meq O₂/kg. These results are still below the threshold value required according to SNI, which is below 5 meq O₂/kg

The nutritional component in palm oil that is easily degraded through heating and oxidation processes is carotene. In this study, a distillation process was carried out at a temperature range of 100-140°C, where this temperature is the basis for consideration in refining palm oil, considering that in the conventional process at a temperature range of 220-270°C, carotene degradation occurs which causes the carotene content to be lost during the distillation process. Therefore the use of a temperature range of 100 -140°C will affect the carotene content in red palm oil. The results showed that the carotene content was in the range of 467-586 ppm.

CONCLUSION

The use of the vacuum pressure distillation method greatly affects the quality of the red palm oil produced. Where the fatty acid content is in the range of 0.03-0.08%, while the peroxide content is in the range of 0.11-0.15 meqO₂/kg, and the carotenoid content is in the range of 467-586 ppm.

MATERIAL AND METHOD

The main raw material is CPO from Pasangkayu, while materials for analysis of RPO characteristics include HCl, NaOH, H₃PO₄, KOH, PP, hexane, ethanol, CH₃COOH, Na₂S₂O₃, whatman paper and aquadest. CPO sample preparation to produce olein fraction and stearin fraction using a centrifuge speed of 4000 rpm for 30 minutes. The next stage is the degumming process of the olein fraction. The purpose of degumming is to remove gum in CPO, for 30 minutes at 60°C using 85% phosphoric acid, and neutralization process to remove free fatty acids by adding sodium hydroxide. The next stage to maintain the quality of palm oil is a pressure reduction vacuum distillation process with various temperature. The first treatment is distillation with reduced pressure below 100°C at 3 atm pressure, the second treatment is in the 100-120°C temperature range and the third stage is the 120-140°C temperature range. The existence of variations in temperature treatment aims to maintain the carotenoid content in red palm oil due to excessive heating in the oil refining process. Therefore, as far as possible the temperature used in the distillation process is tolerant of these conditions.

Characteristic of Red Palm Oil

Determination free Fatty Acid Content

The oil sample was weighed first as much as 14 g, then put into a 250 mL Erlenmeyer glass, then added 25 mL of 96% ethanol, followed by the addition of 2 mL of PP indicator. Titrate with 0.05 N NaOH until a pink solution is formed.

Determination Peroxide Number Content

5 g of the oil sample was weighed first, then put into a 250 ml Erlenmeyer glass, then added 12 mL of chloroform and 18 mL of glacial acetic acid into the Erlenmeyer glass. The next step is to shake the solution until it dissolves. After that, 0.5 mL of saturated KI solution was added. The mixture was then added 30 ml of distilled water. The process of titrating Na₂S₂O₃ 0.005 N until the solution changes color to blue with the addition of 0.5 ml of 1% starch into the solution.

Determination β -carotene Content

The oil sample was heated first and then weighed 1 g. enter into a 25 ml volumetric flask and dissolve it with n-hexane until the limit mark, shake the volumetric flask until it dissolves completely, then measure the absorbance with a wavelength of 446 nm.

DECLARATION

There is no conflict of interest from authors for this research

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