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Peroxides and Saponification Value to Some Packaging of Palm Oil after Frying Repeatedly

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Abstract : Detection of peroxide Gives the initial evidence of rancidity in unsaturated fats and oils. So is the saponification value, which is one indicator to see the changes on palm oil is being investigated. The study design was completely randomized with 15 groups [five groups of packaging of palm oil with three groups of frying (1x, 4x and 8x frying)] and 5 replications. Chemical analysis consisted of the determination of both peroxide and saponification value. The data were analyzed using Analysis of Variance (ANOVA) with further Post Hoc test - Bonferroni. The result is peroxide value increase significantly ($p<0.05$) but saponification value decrease not significantly ($p>0.05$). Changes of color (yellow to dark brown) and smell less good (racidity).
Keywords : peroxide value,saponification value, smell, color.

Introduction

The use of palm oil can not be separated from the daily life of the wider community in the world. Cooking palm oil circulating in the community in the form of bulk oil and packaging. Bulk oil consumption 63% and 37% oil packaging.[1]Therefore, it should be a concern of all parties to maintain the health of society at large and continuous.

Fried oil will produce a variety of compounds that taste liked or disliked. It relies on changes in the stability of the taste or quality of the oil by hydrolysis, oxidation, and polymerization. Tocopherols, essential amino acids, and fatty acids in the diet degraded during frying. Changes frying oil depends on factors like the freshness of the oil, frying conditions, the original quality of cooking oil, fried foods, types of frying, antioxidants, oxygen concentration. Frying temperature is high, the amount of fried oil, free fatty acids, polyvalent metal, and unsaturated fatty acids decrease the stability of the oil due to oxidation and the taste quality of the oil. Frying oil with high temperatures can degrade the effectiveness of antioxidants.[2]

The peroxide value is used to determine the level of oil damage. The peroxide value standard for vegetable oils that do not undergo rancidity should be well below 10 meq/kg. The value of free fatty acid is often used as an indication of the general condition and the nature of the oil is safe to eat.[3]Saponification value is a rough index of the molecular weight of the fat or oil. The smaller the saponification value higher molecular weight. It also shows the magnitude of the amount of alkali required to convert the amount of fat or oil to be soap. It can be used for checking the purity of fats or oils.[4]

Material and Methods

Physics Test (SNI 7381-2008)

Physics test conducted by organoleptic test on odor and color of bulk cooking oil. Odor: Example whipped then opened, then kissed the test sample at a distance of approximately 5 cm from the nose and then

whisked toward the nose. This analysis is done by a minimum of three panelists or 1 experts. Color: Samples of oil was transferred into a test tube and then observed with the eye, carried out by at least three panelists or one expert.

Chemical tests (SNI 01-2=3555-1998)

Chemical parameters to determine the quality of cooking oil consisting of peroxide and saponification test. Peroxide Numbers (SNI 01-2 = 3555-1998). 10 grams of sample is weighed into Erlenmeyer flask, added 30 mL of a solvent mixture consisting of 60 percent of glacial acetic acid and 40 percent chloroform. Then added 1 gram of crystal KI shaken. Let stand in a dark room for 30 minutes. The solution was added to 30 mL of water. Then dititer with Tio 0.02 N until the brown color to yellow, added 1% starch indicator, the endpoint is known by a color change from blue to colorless. In the same way also created a blank titration. Peroxide can be calculated using the formula below: $mgO_2/100g = \frac{(a-b) \text{ x } N \text{ x } BE-O_2 \text{ x } 100}{\text{Sample (g)}}$ .Description: a = ml of Tio to titrate the sample, b = mL of Tio for blank titration, N = normality of the solution Tio, BE = equivalent weight of oxygen.

Saponification value (ISO 01-2 = 3555-1998). A total of 1.5 to 5 g of oil was weighed in a 50 mL Erlenmeyer was then added KOH solution made of 40 g KOH in 1 liter of alcohol. After it closed with cooling behind and simmer for 10 minutes then cool and add a few drops of phenolphthalein indicator and titrate excess KOH solution with the standard solution of 0.5 N HCl. Furthermore, a blank titration is made with the same procedure except without oil.

Data Analysis

Data obtained from the measurement parameter peroxide and saponification values are analyzed by Anova level of 5%. If there is a significant difference ($p<0.05$), will be followed by Post Hoct Test - Bonferroni which in Bootstrapping using SPSS software version 22.[5–8]

Results and Discussion

Results

Based on the results of observations of odor, color, peroxide value and saponification value of various kinds of cooking palm oil can be seen in Table 1 and Figures 1-2 below.

Table 1.Results of the examination odor and color according to ISO 7381-2008.

No.	Groups	Odor	Color
1.	A1	normal	pale yellow
2.	A2	normal	pale yellow
3.	A3	normal	yellow
4.	B1	normal	pale yellow
5.	B2	normal	pale yellow
6.	B3	normal	yellow
7.	C1	normal	pale yellow
8.	C2	normal	pale yellow
9.	C3	rather rancid	dark brown
10.	D1	normal	pale yellow
11.	D2	normal	pale yellow
12.	D3	normal	yellow brownish
13.	E1	normal	pale yellow
14.	E2	normal	pale yellow
15.	E3	normal	yellow

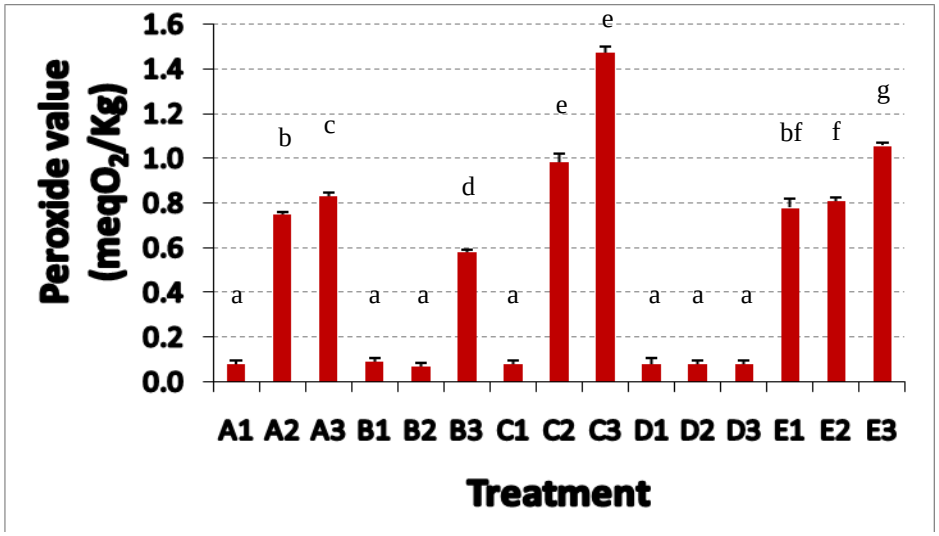

Figure 1.The peroxide value of various kinds of cooking palm oil products packaging.$p^{a,b}$<0.05 between groups.

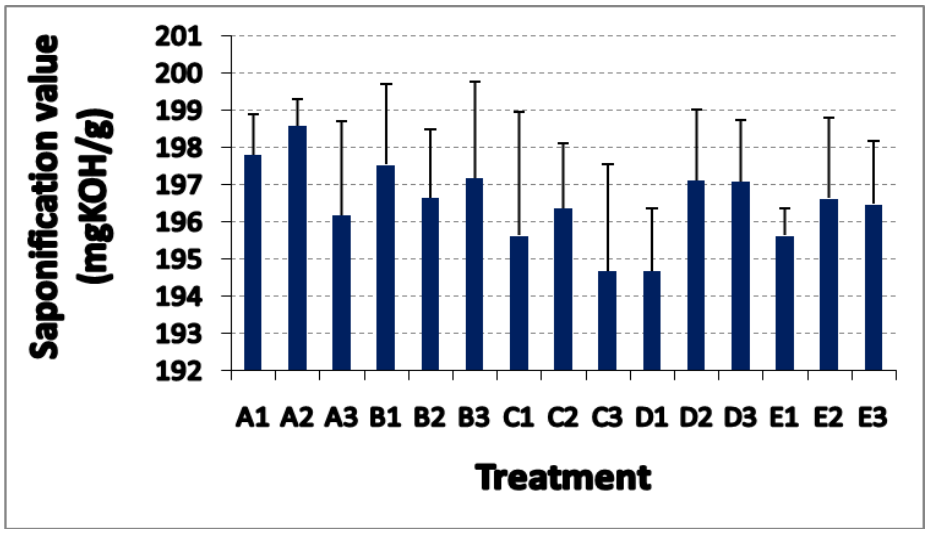

Figure 2.Saponification value of various kinds of cooking palm oil products packaging.$p^{a,b}$> 0.05 between the treatment groups.

4.2. Discussion

In Table 1 shows the change of normal value scent becomes somewhat rancid and color from pale yellow to dark brown on the palm oil fried 1 times, 4 times and 8 times at a temperature of 180-200^{o}C. This shows the effect of repeated heating of oil palm against physical and chemical damage palm oil. It is seen that the oil with the mark A, B, and E is better than C and D. The reforms are due to the influence of temperature on the chemical bonds of palm oil or substrate contained in it, so that their chemical bonding structure changes. Changes may occur due to increased oxidation and saturation away from the cooking oil.

Reheating of the vegetable oil at high temperatures leads to oxidation, which produces rancid odor and flavor.[9,10]Subsequently, the oxidation process reduces both the nutritional value as well as the safety of fried food products through the formation of secondary products due to peroxidation of polyunsaturated fatty acids (PUFAs)[12,13]

Figure 1 shows the real effect of heating repeatedly to increase the peroxide value ($p < 0.05$). The entire sample of palm oil increased packaging peroxide value after a heated eight times. This indicates an increased

oxidation of fat or oil due to high temperature. Research results of Ayala et al.,[14]shows a significant increase in peroxide value with increasing temperature and frying time. According toBarrera[15], that the significant increase in peroxide with increased storage temperature. These results indicate a synergistic effect with a high temperature long time to peroxide. Measurement of peroxide value is basically measured levels of peroxide and hydroperoxide formed in the early stages of fat oxidation reactions. High peroxide value indicates the fat or oil has undergone oxidation, but at a lower figure is not always indicate the condition of oxidation is still early. Low peroxide value could be due to the rate of formation of new peroxide is smaller than the rate of degradation into other compounds, given the levels of peroxide rapidly degrading and react with other substances.[16,17]

In Figure 2 looks impairment lathering do after the heating or frying repeated for all samples of bottled palm oil. Oil is basically a large structure that canlysisinto fatty acids and glycerol. Saponification value means the amount of KOH or NaOH required for lysis of oil. Heating bottled cooking oil repeatedly caused the breakdown of oils into fatty acids and glycerol. The remaining oil so slightly and cause a number of KOH or NaOHjust need a little bit to react with oil, and lead to lower saponification value. The results obtained by the absence of any real effect repeated heating to change the saponification value ($p>0.05$). This is according to the results of research of Onyeikeand Eugene (2003)[18], that the heat processing did not significantly ($p>0.05$) affect the iodine value and the saponification value.

According to the National Standardization Body (1995), the eligibility criteria smell and taste is normal, russet, peroxide maximum 1.6 mgO2 / 100g, and saponification 196-206 (ISO-3741-1995). Testing physics of observing the color and smell or the smell of the oil.Requirements to test the smell is normal, but to test the color is white, pale yellow to yellow (ISO-3741-2002).

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