

## **THE EFFECT OF STORAGE TIME AND ORIGIN OF RAW MATERIALS ON CPO QUALITY IN FFA, LAUNDRY AND MOIST PARAMETERS IN PKS INTI GUNA NABATI**

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### **ABSTRACT**

Indonesia is currently the largest palm oil producer in the world with a production of around 3,855,000 tons/year in 2023. This study discusses the potential and quality of palm oil based on the duration of fruit storage (1, 2, 3, 4, 5, 6 and 7 days). The research was carried out from November to December 2023, at PT Inti Guna Nabati, Sarolangun, South Sumatra. The parameters measured for oil potential are crude palm oil (CPO) content, and the quality of palm oil measured is the bleaching regression index (DOBI), free fatty acid content, and moisture content from northern FFB suppliers (Rasau B2 Pamenang Village, Merangin District) and southern FFB suppliers (Setia Marg Village, Muara Lakitan District). Free fatty acids are determined by titration, and moisture content is measured with an electronic moisture analyzer. The purpose of this study is to find out the quality of the two FFB suppliers that are good and suitable for further processing at PKS IGUN. It will be better to bring FFB 1-2 days after harvest directly to the mill because the quality still meets the criteria of the IGUN mill. The results of the study show that the quality potential of FFB is the longer it is stored, the higher the FFA level, the lower the moist, the lower the DOBI. Based on the results of the study, the length of fruit storage has a bad effect on the quality of palm oil. Based on the results of CPO research from Rasau B2 Pamenang Village, Merangin District for FFA 2.13, moist 1.00 and DOBI 1.712, while the results of CPO research from Setia Marga Village, Muara Lakitan District are FFA 2.48, moist 0.47 and DOBI 1.681. Of the two research results, the CPO results from Rasau B2 Pamenang Village, Kec are better.

**Keywords :** *palm oil, FFA, laundry, moist*

### **INTRODUCTION**

The oil palm (*Elaeis guineensis Jacq*) is a tropical plant belonging to the Palmae family and native to West Africa. However, there are those who state that oil palm comes from the United States, namely Brazil because more oil palm species are found in Brazilian forests compared to Africa. (Yan Fauzi, 2008)

In general, there are two types of palm oil, namely palm oil derived from the extraction of fruit pulp (coir) and palm oil derived from the extraction of palm kernel (kernel). The result of fruit pulp extraction is called crude oil or *Crude Palm Oil* (CPO), while the result of fruit core extraction is called kernel or PKO (*Palm Kernel Oil*). *Crude Palm Oil* (CPO) is the result of processing the pulp of oil palm fruit. In the form of a rather thick oil with a reddish-yellow-orange color. (Ardha Panca Wardanu, 2009)

Among the businesses owned by Dharma Agung Wijaya (DAW) Group, in addition to being engaged in energy and resources, it also has a business in the plantation sector and owns several palm oil mills (PKS) spread across Sumatra and Kalimantan. PT Inti Guna Nabati (PT. IGUN) is one

of the units of the company engaged in oil palm plantations. (Feby Yuliantika, 2021)

PKS Inti Guna Nabati is one of the 4 factories owned by Dharma Agung Wijaya (DAW) which was taken over from PT MAS (Mitra Agroila Sejahtera) in 2016. In the FFB processing process, the IGUN Palm Oil Mill (PKS) has a processing capacity of 30 tons/hour. In accordance with the purpose of establishing the palm oil mill, it is to carry out activities to process palm oil Fresh Fruit Bunches (FFB) into palm oil or *Crude Palm Oil* and Palm Kernel (Kernel). (Feby Yuliantika, 2021)

In the palm oil processing process, the quality of the processed products is highly determined by the raw materials. Palm oil processing requires good quality both qualitatively and quantitatively. The low quality of palm oil is largely determined by many factors. These factors can be directly from the nature of the parent tree, post-harvest handling, transportation and errors during processing.

Quality control is one of the most important functions of a company to be able to win competition in the industrial world. Quality control activities are expected to help companies maintain and improve the quality of their products by controlling the level of product defects to the level of zero defects.

Therefore, these quality control activities can be carried out starting from raw materials, during the production process to the final product and adjusted to the set standards. Quality standards are the most important thing to determine good quality palm oil. Good palm oil quality must have several factors that determine its quality standards, such as the content of Free Fatty Acids (FFA), Moisture and Dirt.

The oil palm plant which is the raw material for the Inti Guna Nabati PKS is the Tenera variety of palm oil, because from an economic point of view the Tenera variety produces high oil, so that it benefits the mill. The quality of palm oil production as a food ingredient has quality aspects related to the parameters of fatty acid content, moisture content and dirt content.

Palm oil mills are operated in a continuous series, where the results of the previous process are carried over to the next. Mistakes in the initial process will get bad results in the next process. Free Fatty Acids (FFAs) are acids that are released on hydrolysis from fats. There is a wide variety of fats, but for calculations, palm oil's FFA content is considered to be Palmitic Acid (molecular weight 256).

Moisture content is the amount of water content present in the sample. Moisture content can affect the quality of CPO, the higher the moisture content, the lower the quality of CPO. Impurity levels are insoluble substances in oil, which can be filtered after the oil is dissolved in a solvent. The content of free fatty acids (FFA), moisture content and impurities in palm oil in storage tanks or storage tanks before being marketed are analyzed to determine the quality of palm oil. In this case, the cleanliness of the storage tank needs to be maintained, by washing it 2 times in 1 year to reduce the increase in free fatty acid levels, moisture content and dirt levels. In PKS IGUN itself does not have its own garden, so the raw materials that go to the PKS only rely on FFB from local farmers. The obstacle is the quality or quality of the FFB of the farmers. Lack of understanding of farmers regarding harvesting based on the level of fruit ripeness. And the company itself has not been able to provide quality standards to farmers so that farmers only refer to the color of FFB (orange) and directly send the FFB to the mill.

At PKS IGUN, analysis is carried out every day to determine the quality of CPO. After analysis, CPO can be sent directly to be marketed, because the longer CPO is stored in the storage tank, it will cause the low quality of the CPO, unless there are obstacles such as transportation and damaged roads that do not allow oil to be shipped or marketed with the record that the selling price of palm oil is cheap. In this study, the author conducted research for 4 days, because within 4 days it was possible to know the quality of the CPO that had been processed and would be sent or marketed by PKS IGUN every day.

An increase in the level of free fatty acids can also occur in the hydrolysis process in the factory, in which chemical decomposition occurs assisted by water and takes place under certain conditions. Hot water and steam water at a certain temperature are auxiliary materials in the processing process. However, a less careful processing process results in unwanted side effects, the quality of the oil decreases because water at certain temperature conditions does not help the processing process but instead decreases the quality of the oil.

Based on the description above, a study was conducted with the title "The Effect of Storage Time and Origin of Raw Materials on CPO Quality on FFA, DOBI and Moist Parameters in PKS Inti Guna Nabati".

## **RESEARCH METHOD**

### **Material and Equipment**

The tools used are manual fruit press, volumetric 50 ml, erlenmeyer 250 ml, measuring cup 100 ml, beker glass 100 ml, cuvette 2.5 ml, cup, analytical balance, scale 100 kg, memmert brand oven, spectrophotometer, and moisture analyzer. The materials used are samples of CPO oil, NaOH 0.25 N, Iso Hexane, N-Hexane, Alcohol 95%, and filter paper

### **Free Fatty Acid (FFA) Content Analysis**

Weigh a 10-gram sample with a digital analytical balance, then put it into a 250 ml Erlenmeyer, add 20 ml of Iso Hexane, 30 ml of 96% alcohol and 2-3 tetra thymol blue, titrate with a 0.1 N KOH solution until the solution is bluish-yellow, record the volume of the used KOH solution, and calculate the level of Free Fatty Acids.

Formula:

$$\% \text{ ALB} = \frac{(V \times N) \text{ KOH} \times (\text{BM Asam Palmitat})}{\text{g example}} \times 100\%$$

### **Moisture Content Analysis**

Dry the glass beaker in the oven for 15 minutes at 1050°C, let it cool in the desicator for 15 minutes. Weigh the empty glass, put the sample of 10 grams (W2) into the glass beaker and weigh (W1), heat it in the oven for + 3 hours at 1050°C, cool the sample in a desiccant for 15 minutes, weigh (beaker + sample) using the analytical balance after oven (W3), and calculate the moisture content.

Formula:

$$\text{Up Air (\%)} = \frac{W1 - W3}{W2} \times 100\%$$

Information:

W1 = sample weight + beaker glass weight before oven

W2 = sample weight

W3 = sample weight + beaker glass weight after oven

### Laundry Value Analysis

Heat the oil sample from oil palm fruit extraction at a temperature of 60-70°C until it looks dilute and homogeneous, then weigh the oil sample as much as 0.2 g into a volume of 50 ml, then add n-hexane to the limit of the volumetric flask and shake the solution to combine the oil and n-hexane (homogeneous), and measure the arbonsiness of the sample using a spectrophotometer.

### RESULT AND DISCUSSION

Before conducting the research, we first took samples from the northern Tbs suppliers (Rasau B2 Pamenang Village, Merangin District) and South (Setia Marg Village, Muara Lakitan District) each of 7 Tbs (total 14 Tbs). In order for us to test the storage of Tbs from North and South suppliers for up to 7 days. The Tbs of the north and south swivels can be seen in figure 1



**Figure 1.** Tbs from northern and southern suppliers

Then we hang the Tbs to the lorry to be boiled in a sterilizer for 85-90 minutes. Tbs on the truck hanger for the heating process can be seen in picture 2



**Figure 2.** Tbs are hung on trucks for the heating process

After we boil in the Sterilizer, the Tbs sample is taken by the analyst to be continued to analysis in the laboratory. From the results of the analysis on the data, we can change it again into the form of a graph for each variable as follows:

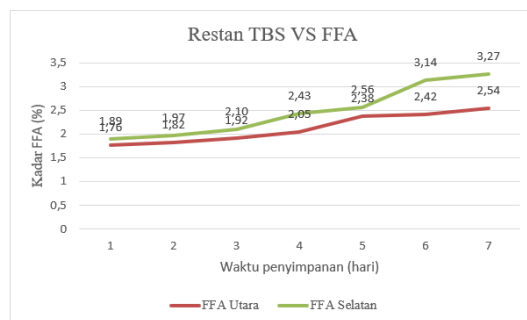
#### Effect of fruit storage time on FFA content

The results of measuring the effect of the length of fruit storage time on the content of palm oil-free

fatty acids are shown in Figure 3. Figure 3 shows that based on the results of the analysis, the treatment of the length of the fruit storage time for 7 days, is significantly different from the results. This means that the treatment of the length of the fruit storage time has a significant effect on the content of palm oil-free fatty acids. The longer the fruit is stored, the higher the content of palm oil-free fatty acids.

From the results of the study, it is known that the average increase in palm oil-free fatty acids for fruit storage for 1 day, 2 days, 3 days, 4 days, 5 days, 6 days and 7 days in a row for suppliers from the north is 0.06%, 0.10%, 0.10%, 0.13%, 0.33%, 0.04% and 0.12% and suppliers from the South is 0.08%, 0.13%, 0.33%, 0.13%, 0.58% and 0.13%. The main factor that determines the fatty acid content is the age of the fruit used to process the oil. The longer it is stored, the higher the contamination, damage, and free fatty acid content of the oil. Man and Moh (1998) stated that free fatty acids in palm oil (CPO) can increase due to enzyme activity in palm fruit and lipase microbes.

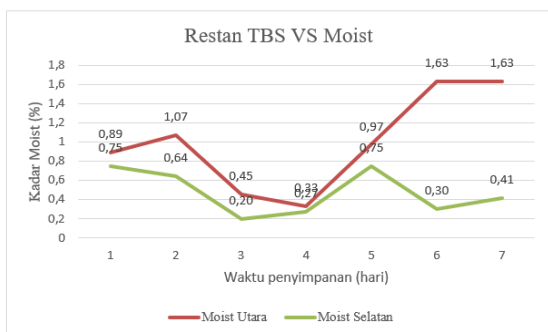
The Ministry of Industry (2007) stated that high-quality palm oil has a content of no more than 2% free fatty acids, and the standard quality of free fatty acids is not more than 5%. Quality palm oil will produce the lowest free fatty acid content of around 1.7-2.1%.



**Figure 3** Effect of long storage time of oil palm fruit on FFA levels

#### Effect of fruit storage time on palm oil moisture content

The results of measuring the effect of the length of fruit storage time on the moisture content of palm oil are shown in Figure 4. Figure 4 shows that the longer the fruit is stored, the higher the moisture content of the palm oil produced. Ketaren (2005) stated that high moisture content can cause damage to CPO, this is related to the hydrolysis reaction that occurs which can increase the level of free fatty acids in palm oil and the reaction is accelerated by bases, acids and enzymes.

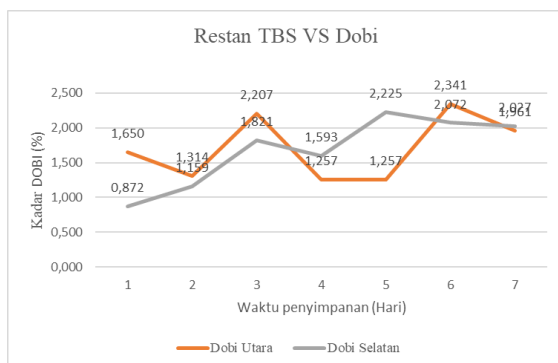


**Figure 4.** Effect of long storage time of oil palm fruit on moist content

#### Effect of fruit storage time on palm oil DOBI

Afriani (2009) stated that DOBI (Deterioration of Bleachability Index) is an index of the degree of paleness of crude palm oil. The purpose of bleaching is to remove the less desirable color (bleaching) in the oil, so DOBI is important to assist in processing in the refining of palm oil. The results of the palm oil DOBI measurement are shown in Figure 5.

In Figure 5, it can be seen that the longer the fruit storage time, the lower the DOBI value of palm oil. Based on the results of the analysis, the treatment of the length of fruit storage time for 1 day, 2 days, 3 days, 4 days, 5 days, 6 days and 7 days had a significant effect on the palm oil DOBI in the treatment. From the results of the measurement, according to Lin (2004) that CPO is of good quality if the DOBI value is 2.30, this result has been studied by the Palm Oil Research Center. While in figure 10 we can see that the DOBI value is irregular, this is natural because farmers do not understand how to manage their oil palm plantations, both in terms of fertilization, pruning and others.



**Figure 5** Effect of oil palm fruit storage time on DOBI

#### CONCLUSIONS

Based on the results of the research that has been carried out, several conclusions can be drawn:

1. Fruit storage time was affected based on research on FFA, moist and DOBI parameters in Rasau

B2 Pamenang Village, Merangin District for FFA 2.13, moist 1.00 and DOBI 1.712.

2. Fruit storage time has an effect based on research on FFA, moist and DOBI parameters in Setia Marga Village, Muara Lakitan District, namely FFA 2.48, moist 0.47 and DOBI 1.681.

#### REFERENCE

- Agustina, Reni. (2007). *Elaeis guineensis* (Kelapa Sawit). <http://www.toiusd.multiply.com>. Diakses 24 Mei 2010
- Fauzi, Yan. (2008). *Palm Oil*. Revised Edition. Jakarta: Independent Publishers. Fesseenden & Fesseenden. 1986. Organic Chemistry 3rd Edition Volume 2. Jakarta : Erlangga
- Hermansyah, (2009). Heri, Dimas Prabu, et al. *A simple kinetic model for the hydrolysis reaction of olive oil using lipase*. Department of Chemical Engineering, Faculty of Engineering, University of Indonesia, UI Depok Campus, Depok 16424 Tel. 7863515, 7863516. Email: heri@chemeng.ui.ac.id.
- Maruli Pardamean. (2008). *A Complete Guide to Palm Oil Plantation and Mill Processing*. Jakarta: PT. Agromedia Library.
- Polytechnic. (2008). *Benefits of Palm Oil*. <http://www.politeknikcitrawidyaedukasi.wordpress.com>. Retrieved 24 May 2010
- Rohman, Abdul and Sumantri. (2007). *Food Analysis*. Yogyakarta: Gadjah Mada Univertisy Press.
- Mangoensoekarto, S. (2005). *Palm Oil Agribusiness Management*. Yogyakarta : Gajah Mada University Press.
- Writing Team. (2009). Pekanbaru: PT. Nusantara Plantation V. Data and Information Center Preparation Team. 2007. *A Glimpse of Palm Oil*. South Jakarta: Ministry of Industry.
- Sastrosayono, Selardi. (2003). *Oil Palm Cultivation*. Jakarta: Agromedia Pustaka)
- Wardanu Panca, Ardha. (2009) . *Produk Lanjutan Crude Palm Oil (CPO)*, [www.Wordpress.com](http://www.Wordpress.com). Diakses 13 Maret 2010
- Feby, Yuliantika, (2021). Product Application at PT. DAW Group's Vegetable Essence
- Nuri, Purwiyatno, Puspoo and Didah. (2022). *CPO Quality Standards for Edible Oil and the Application of Good Palm Oil Production Practices*.