Table 3 shows that the dominant fatty acid type in OPMF oil is similar to the dominant fatty acids of CPO, namely C16:0 Palmitic acid and C18:1 oleic acid with respective average of 30.39% (CPO 44.0%), and 33.21% (at CPO of 39.2%). This is because CPO and OPMF oil are both derived from Palm Fruit Bunches mesocarp. However, there is a difference in terms of the amount of lauric fatty acids. Oil produced by OPMF at the three POMs respectively contained 22.0%, 2.65% and 21.34% lauric acid, while the lauric acid in CPO oil was only 0.2%. The results of this study were consistent with that of Majid et al (2012) and Neoh et al (2011) who reported the dominant fatty acids of OPMF oil were palmitic acid (31.9%), oleic acid (24.8%), and lauric acid (22.0%). Lauric acid in the OPMF oil originated from crushed palm kernel during pressing. Crushed palm kernel was blended and mixed with OPMF, so that as OPMF was macerated, the oil in the Crushed palm kernel was extracted. Based on the fatty acid composition of OPMF oil which is of no difference with that of fatty acid composition of CPO as shown in Table 3, it can be inferred that oil maceration from OPMF allows CPO to increase and decreases the value of oil loses in POM and can be used as a substitute of CPO as a raw material in food industry.

Antioxidation Power (IC50) of OPMF Oil with DPPH Method

The result of observation of OPMF oil antioxidation power using DPPH method can be seen in Table 4 below.

Table – 4: Correlation of OPMF oil concentration with damping percentage

Consentration (ppm)	% Damping
DPPH (blanko)	0
0,5 ppm	7.75
2 ppm	16.17
4 ppm	36.16
8 ppm	57.1
10 ppm	60.36
12 ppm	65.67
15 ppm	70.68

Table 4 shows that the higher carotenoid concentration in the OPMF oil, the more the number of dumped DPPH increased from 0% at 0 ppm oil concentration to 70.68% at 15 ppm oil concentration. The increase of DPPH damping percentage is due to the increasing number of carotenoid as electron giver to DPPH. By giving electrons of hydrogen atoms from carotenoids to DPPH as free radicals, the electrons in DPPH formed a pair. Consequently, paired electrons lost their nature as free radicals. The state of losing free radicals is called the damping process (Gurav et al., 2007). The carotenoid-free radical damping mechanism was performed by binding the singlet oxygen and converting it into a triplet oxygen. The excited carotenoid releases heat and then returns to a stable caretonoid (Gordon, 1990).

$$^1O^2 + \text{carotenoid} \longrightarrow 3O2 + *\text{carotenoid}$$
$$*\text{carotenoid} \longrightarrow \text{Carotenoid} + \text{heat energy}$$

The correlation of OPMF oil concentration with the amount of dumped DPPH (%) was calculated using linear regression of $Y = 4.458\ X + 12.11$ with $R^2 = 0.927$. The value of IC_{50} (concentration of test sample capable of trapping free radicals by 50%) was used as a parameter to determine antioxidant activity of the test sample (Prakash, 2001). By substituting Y with a value of 50% on the regression equation of $Y = 4.458\ X + 12.11$, then the X value obtained 8.499 ppm. As a result, IC_{50} OPMF oil of 8.49 ppm was obtained. The antioxidant activity of oil palm mesocarp extract was classified in the very strong category with an IC_{50} value of 8.49 ppm, much stronger than pure carotene beta having IC_{50} of 551 ppm (Kurniawati, et al., 2007). The compounds classified as extremely strong antioxidant if the IC_{50} value is less than 50 ppm, strong antioxidant if $IC_{50}$is 50 to 100 ppm, moderate antioxidant if IC_{50} is 100-150 ppm and weak antioxidant if IC_{50} is 151 - 200 ppm (Mardawati, et al. 2008). The antioxidant activity of OPMF oil is extremely strong due to the amount of carotene and other minor compounds such as Vitamin E in the OPMF waste oil higher than that of other oils (Choo et al, 1989). Manasika and Widjarnarko (2015) stated that the more the amount of carotene in the material, then the more powerful the antioxidant power gets, leading to IC50 getting smaller. The extremely low IC_{50} (8.49ppm) indicated that OPMF oil can be potentially used as a functional food antioxidant and natural antioxidant substituting artificial antioxidants

such as BHA (Butyl Hidroxy Anisol) and BHT (Butyl Hidroksi Toluene).

The effect of GHG reduction after oil maceration

The effect of GHG CO2 reduction (eq) after maceration was calculated by the following measures. OPMF oil content was 3.91% and the OPMF weighing at 496 kg, resulting in the amount of oil contained in OPMF before maceration weighing at 19.35 kg. The amount of calorific heat burning before maceration was 176,342.35 Kkal (19.35kgx9113.3Kkal / kg) or 0,000737 TJ. Liquid organic fuel with a 1 TJ calorific value will produce GHG emission of 79.996 kg CO2 (eq) (IPCC 2006) leading to the organic fuel with a 0.000737 TJ caloric value produces 58.95 KgCO2 (e). Macerated OPMF content was 3.47%, leading to the OPMF oil content after maceration became 0.44% (3.91-3.47%). The amount of oil left in the OPMF after maceration was 2.17 kg. The amount of GHG resulted from the burning of 2.17 kg of oil was 6.62 KgCO2 (e). The effect of GHG reduction after maceration = $\frac{(58{,}95-6{,}62)\ \mathbf{kgCO2\ (e)}}{58{,}95\ \mathbf{kgCo2\ (e)}}$ x 100%= 88.77%. The summary of the effect of GHG reduction after OPMF maceration is presented in the following table.

Table – 5: Effect of GHG reduction CO2(e) after OPMF waste maceration

Parameter	Before maceration	After maceration
Oil Content (%)	3.91	0.44
Total Oil (kg)	19.35	2.17
Total GHG (CO2.eq)	58.95	6.62
Effect of GHG reduction (CO2.eq) after maceration	88.77%	

Conclusion

The findings above lead to the following conclusions: The quantity and quality of oil isolated from OPMF residue is higher than oil isolated from EFBS for the following reasons: oil content higher by 3.91% (2.86% in EFBS), oil yield by 3.47% (2.26% in EFBS), carotenoid levels were higher at 2305 ppm (915.25 ppm in EFBS), DOBI higher by 3.49 (1.14 in EFBS), and FFA lower by 9.68% (21.58% in EFBS). The OPMF oil fatty acid composition is generally similar to that of CPO fatty acid composition of which is dominated by C16:0 palmitic acid and C18:1 oleic acid, at an average of 30.31% (at 44.0% CPO) and 33.22 % (at 39.2% CPO) respectively. Antioxidant activity (IC50) of OPMF Oil was at 8.49 ppm (extremely strong antioxidation power category).. The effect of GHG emission reduction after OPMF oil maceration can potentially reach 88.77% of the amount of GHG emissions before maceration.

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