Quality changes of chicken frying oil as affected of frying conditions

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Abstracts: The marinated chicken drumsticks were fried at 170, 180 and 190°C for 15, 18, 21 min then physical and chemical qualities of used oil and fried chicken drumsticks were evaluated. The color, viscosity of used oil and surface color of fried chicken tended to increase with frying temperature and time. PV, FFA and *p*-AV of used oil and fried chicken drumstick were significantly increased ($p<0.05$) with frying time. Frying with various ratios of oil to chicken drumsticks showed that lower proportion of oil to chicken (10:0.5) could prolong the changes in used oil quality when compared with higher proportion. The quality of used-fried oil as repeated frying 3 consecutive days by 10 batches a day showed better oil quality than those continue frying for 30 batches a day. The color of fried chicken became darker with higher proportion of chicken to oil ratio similar to color of used-fried oil.

Keywords: Frying oil, oil quality change, fried chicken

Introduction

Deep-fat frying is one of the most popular procedures for food processing since it is rapid and develops desirable flavors and textures (Sanibal and Mancini-Filho, 2004). During the frying not only water vapor but also other compounds moved from the food into the fat, which were combined high frying temperature leading to degradation of the frying oil (Mellema, 2003). The frying oil degradation produced volatile and non-volatile compounds. Most of volatile compounds evaporate in the atmosphere with steam and the remaining non-volatile compounds in oil undergo further chemical reactions or absorbed in fried foods. The non-volatile compounds in the oil affected the physical and chemical properties fried foods, i.e. flavor stability, taste and texture during storage. Deep-fat frying also decreased the unsaturated fatty acids of oil and increased foaming, color, viscosity, density, specific heat, and contents of free fatty acids, polar materials and polymeric compounds (Choe and Min, 2007). Therefore, repeated deep-fat frying can produce constituents that not only influence food quality but also can induce the formation of compounds with adverse nutritional implications and potential hazards to human health (Sanibal and Mancini-Filho, 2004). In Hat-Yai, Songkhla province of Thailand, fried chicken is highly popular among local and visitors. Fried chicken retailers use the simplest frying system consists of gas flames placed directly against the bottom of frying kettle. The frying condition and recipe may vary from one to another. Since the price of frying oil and chicken is increasing, then the retailers need to maximize using frying oil until it is no longer suitable for use. It is necessary to determine the appropriate point between usage of frying oil and the safety and quality of final product. The objective of the present study was to investigate the effect of frying temperature and frying time, ratio of chicken drumsticks to oil and repeated frying on the quality changes of chicken frying oil.

Materials and Methods

Palm olein oil and chicken drumsticks were purchased from local supermarkets in Hat-Yai, Songkhla. The chicken drumstick (100 ± 10 g) were washed, drained for 2 min., marinated with seasoning mixture (salt, sugar, pepper, garlic, rice starch) and stored in a refrigerator at 4°C for 24 h.

Effect of frying temperature and frying time on quality changes of oil and fried chicken

Seasoned chicken drumsticks were fried in palm oil at 170, 180 and 190°C for 15, 18 and 21 min. The ratio of oil to chicken drumsticks was 10:1 (v/w). After frying process, the oil sample was withdrawn and cooled to room temperature. Peroxide value (PV), free fatty acid (FFA) and p-anisidine

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value (*p*-AV) were analyzed according to the IUPAC Standard Methods 2.501, 2.201 and 2.504, respectively (IUPAC,1979). The color of the oil was measured using CIE Hunter Lab system (ColorQuest XT, Hunter Associates Laboratory Inc, USA). The oil viscosity was measured as according to the modified method from Sanchez-Gimeno *et al*. (2008) using rheometer (Haake, RheoStress RS75, Germany). This procedure, a concentric cylinder probe is submerged in 3 ml of oil sample and rotated at 100 s-1 shear rate. The temperature of measuring system was controlled at 25°C with a water bath connected to the rheometer. For fried chicken drumsticks, the surface color was measured under illuminant D65/0° observer using Hunter Lab colorimeter (ColourFlex, Hunter Associates Laboratory Inc, USA).

Fried chicken drumsticks were collected from 10 retailers in Hat-Yai. Three samples were taken from each retailer then subjected to measure the surface color in term *L**, *a** and *b**. This data was used as a criterion for the selection of frying condition in the experiment.

Effect of oil to chicken ratio on quality changes of oil and fried chicken

Seasoned chicken drumsticks were fried in palm oil at 180°C for 18 min. The ratio of oil to chicken drumsticks were 10:0.5, 10:1.0, 10:1.5, 10:2.0, 10:2.5 and 10:3.0. After frying, oil and chicken drumstick samples were analysis as referred to section 2.1.

Effect of repeated frying on quality changes of frying oil

Repeated frying experiments were divided into two parts. The first, 2.1 kg of seasoned chicken drumsticks were fried in seven liters of palm oil at 180±2 °C for 18 min and ratio of oil to chicken drumsticks was 10:3.0 (v/w). The 30 batches of frying without fresh oil adding were done within 1 day. Every the fifth batches, 200 g of oil sample was withdrawn and cooled to room temperature before subjected to analyze as mentioned in section 2.1. The second, seasoned chicken drumsticks were fried 10 batches a day for 3 consecutive days in the same manner as mentioned above. At the end of each day, frying oil was filtered (without fresh oil adding) and used for frying next day. The analysis of frying oil quality was conducted as described previously.

Statistical analysis

Statistical analysis was performed using analysis of variance (ANOVA). The Duncan's new multiple range test was used to determine the differences among means at 0.05 significance levels.

Results and Discussion

Effect of frying temperature and frying time on quality changes of oil and fried chicken

The effect of temperature and time during deep-fat frying chicken drumstick on PV, FFA and p-AV of the oil showed in Figure 1, 2 and 3, respectively. The results indicated that PV increased in the order: 170°C and 180°C>190°C. The PV of the oil heated at 170°C and 180°C were significantly increased ($p<0.05$) with time increased, whereas frying at 190°C, the PV increased in the first period of frying until reached the peak and started to decrease. An increase in the PV during frying process indicates a decrease of unsaturated fatty acid due to oxidation. However, peroxides are unstable compounds particularly under high temperature conditions; therefore the peroxides decompose to form carbonyl and aldehydic compounds causing the peroxide value to decrease (Shahidi and Wanasundara, 2002). In this present work, both higher frying temperature and longer frying time also caused lower in PV.

The FFA content increased after frying process (Figure 2), especially, frying at 190°C resulted an increase in FFA content higher than lower frying temperatures. The amount of FFA in fats and oils can be used to indicate the extent of its deterioration due to hydrolysis of TAG and/or cleavage and oxidation of unsaturated fatty acid (Abdulkarim *et al*., 2007). The changes of *p*-AV in used-fried oil showed in Figure 3. The *p*-AV of the tested oil tended to increase with frying temperature and time. This may due to the accumulation of less stable primary oxidative products (hydroperoxides) decompose further to form aldehydic compounds. These results agreed with cottonseed oil used for frying of potato chips at temperature 155, 175 and 195°C until 12 h without oil turnover. In addition, the *p*-AV increased linearly with the time of frying at a rate depending on frying temperature as reported by Houhoula *et al*. (2002). It point out that the *p*-AV may be a proper indicator for used oil quality determination compared with PV.

Color and viscosity of frying oil after frying at various temperatures and times were showed in Table 1-2. It was found that increasing frying time resulted slightly decrease of oil lightness (*L**) and greenness (-*a**) but slightly increase in yellowness (*b**). The viscosity of used-fried oil slightly increased with frying time. Color and viscosity of frying oils are physical indicators of oil deterioration caused by oxidation and polymerization. Increasing

Table 1. Color of frying oil after frying at various temperatures and times

Color parameter	Temperature of frying	Time of frying (minutes)		
		15	18	21
L^*	170 °C	95.29 ± 0.01^{cC}	95.18 ± 0.01^{cB}	94.71 ± 0.01^{cA}
	180 °C	95.09 ± 0.01^{bC}	94.86 ± 0.00^{bB}	94.61 ± 0.01^{bA}
	190 °C	94.68 ± 0.01^{aC}	94.65 ± 0.01^{aB}	94.21 ± 0.00^{aA}
a^*	170 °C	-5.86 ± 0.01^{aA}	-5.75 ± 0.01^{aB}	-5.45 ± 0.01^{aC}
	180 °C	-5.54 ± 0.01^{bA}	-5.48 ± 0.02^{bB}	-4.94 ± 0.01^{bC}
	190 °C	-4.52 ± 0.01^{cA}	-4.53 ± 0.01^{cA}	-3.93 ± 0.01^{cB}
b^*	170 °C	51.39 ± 0.01^{cA}	51.87 ± 0.01^{cB}	52.69 ± 0.01^{cC}
	180 °C	49.47 ± 0.01^{bA}	49.98 ± 0.01^{bB}	51.76 ± 0.01^{bC}
	190 °C	49.42 ± 0.02^{aA}	49.45 ± 0.01^{aB}	49.49 ± 0.01^{aC}

* Mean value ± standard deviation (SD) from quadruplicate determinations.a–c Means in the same column of each parameter (L^*, a^* and b^*) with different letters are significantly differences ($p < 0.05$).A-C Means in the same row of each parameter (L^*, a^* and b^*) with different letters are significantly differences ($p < 0.05$).

Table 2. Viscosity of frying oil after frying at various temperatures and times

Temperature of frying	Viscosity value* (cP)		
	15 min	18 min	21 min
170 °C	69.0 ± 0.2^{aA}	69.3 ± 0.3^{aAB}	69.8 ± 0.1^{aB}
180 °C	69.8 ± 0.1^{bA}	69.5 ± 0.3^{aA}	69.7 ± 0.2^{aA}
190 °C	69.6 ± 0.2^{bA}	69.6 ± 0.1^{aA}	70.0 ± 0.1^{aB}

* Mean value ± standard deviation (SD) from quadruplicate determinations.a–b Means in a column followed by different superscript are significantly differences ($p < 0.05$).A-C Means in a row followed by different superscript are significantly differences ($p < 0.05$).

Table 3. Color of chicken drumsticks after frying at various temperatures and times

Color parameter	Frying temperature	Frying time (minute)		
		15	18	21
L^*	170 °C	44.54 ± 1.09^{cB}	40.08 ± 2.11^{bA}	40.87 ± 0.40^{bA}
	180 °C	40.54 ± 0.28^{bB}	40.34 ± 0.26^{bB}	36.28 ± 0.52^{aA}
	190 °C	37.34 ± 0.84^{aA}	36.94 ± 0.38^{aA}	36.21 ± 0.27^{aA}
a^*	170 °C	14.40 ± 0.54^{bA}	14.67 ± 0.55^{bAB}	15.48 ± 0.43^{cB}
	180 °C	15.45 ± 0.52^{bB}	16.17 ± 0.78^{bB}	12.79 ± 0.52^{bA}
	190 °C	11.01 ± 0.49^{aA}	11.78 ± 1.31^{aA}	10.92 ± 0.45^{aA}
b^*	170 °C	28.26 ± 0.18^{cB}	24.22 ± 2.01^{bA}	24.87 ± 0.40^{cA}
	180 °C	24.18 ± 0.60^{bB}	24.05 ± 1.04^{bB}	19.84 ± 0.91^{bA}
	190 °C	18.75 ± 0.67^{aA}	18.52 ± 1.27^{aA}	17.85 ± 0.40^{aA}

* Mean value ± standard deviation (SD) from quadruplicate determinations.a–c Means in the same column of each parameter (L^*, a^* and b^*) with different letters are significantly differences ($p < 0.05$).A-C Means in the same row of each parameter (L^*, a^* and b^*) with different letters are significantly differences ($p < 0.05$).

of color intensity is due to the accumulation of nonvolatile decomposition products such as oxidized triacylglycerols and FFA as well as seasoning agent from marinating chicken. While, an increase of viscosity may due to the formation of high molecular weight polymers leading to the higher the degree of deterioration (Abdulkarim *et al*., 2007).

Color of the fried chicken drumsticks sampled around Hat-Yai reported as L^*, a^* and b^* values were 39.1-42.3, 14.9-18.1 and 24.2-27.9 respectively. From this experiment, it was found that the lightness (L^*), redness (a^*) and yellowness (b^*) of the color of fried chicken drumsticks decreased significantly with frying temperature (Table 3). A decrease in L^* with time may be attributed to Maillard browning reaction and caramelization at the high frying temperature as affected of sugar in seasoning. As well known a rate of the Maillard reaction depends on its chemical environment such as water activity, pH, chemical composition of the food and the reaction temperature (Carabasa and Ibarz, 2000). Frying the marinated chicken at 190°C for 15-21 min and at 180°C for 21 min caused darker products compared with other frying condition. In addition, frying the marinated chicken at 170°C for 18 and 21 min and at 180°C for 15 and 18 min gave similar color to products collected

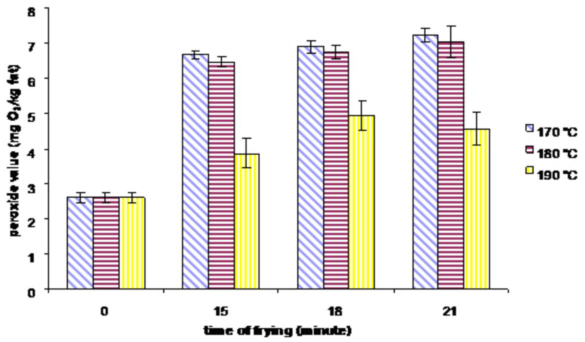

Figure 1. Peroxide value in frying oil after frying at various temperature and time
a–b Means in the same time (0, 15, 18 and 21) with different letters are significantly differences ($p < 0.05$).
A-C Means in the same temperature (170, 180 and 190) with different letters are significantly differences ($p < 0.05$).

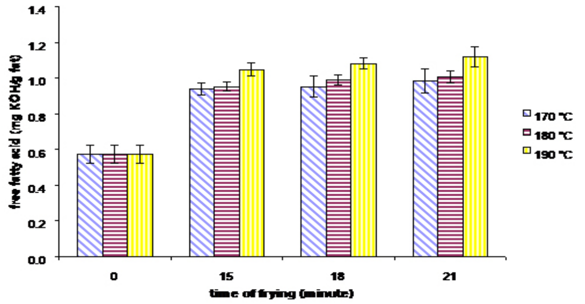

Figure 2. Free fatty acid in frying oil after frying at various temperature and time
a–b Means in the same time (0, 15, 18 and 21) with different letters are significantly differences ($p < 0.05$).
A-B Means in the same temperature (170, 180 and 190) with different letters are significantly differences ($p < 0.05$).

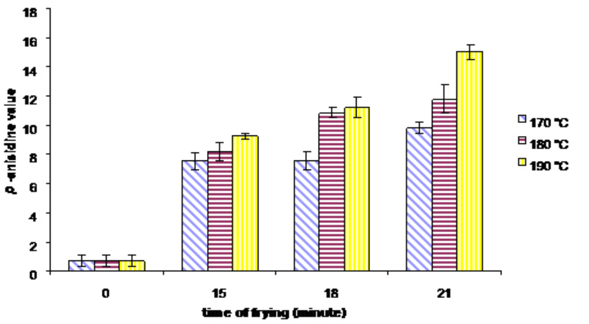

Figure 3. *p*-Anisidine value in frying oil after frying at various temperature and time.
a–c Means in the same time (0, 15, 18 and 21) with different letters are significantly differences ($p < 0.05$).
A-D Means in the same temperature (170, 180 and 190) with different letters are significantly differences ($p < 0.05$).

Table 4. Peroxide value, free fatty acid and p-anisidine value of frying oil after frying at various ratio of oil to chicken drumsticks

Ratio of oil to chicken drumsticks	Peroxide value (mg O_2/ kg fat)*	Free Fatty Acid (mg KOH/g fat)*	*p*-Anisidine value*
10 : 0.5	4.43 ± 0.09[a]	0.20 ± 0.01[a]	0.81 ± 0.05[a]
10 : 1.0	4.86 ± 0.16[b]	0.21 ± 0.00[ab]	1.27 ± 0.07[b]
10 : 1.5	5.47 ± 0.24[c]	0.21 ± 0.01[b]	1.32 ± 0.04[c]
10 : 2.0	5.71 ± 0.24[c]	0.21 ± 0.00[ab]	2.04 ± 0.24[d]
10 : 2.5	5.68 ± 0.19[c]	0.21 ± 0.00[ab]	2.30 ± 0.15[e]
10 : 3.0	5.76 ± 0.11[c]	0.22 ± 0.00[b]	4.06 ± 0.02[f]

* Mean value ± standard deviation (SD) from triplicate determinations.
a–f Means in a column followed by different superscript are significantly differences ($p < 0.05$).

Table 5. Color and viscosity of oil after frying at various ratio of oil to chicken drumsticks

Ratio of oil : chicken drumsticks	The color of frying oil*			Viscosity Value* (cP)
	*L**	*a**	*b**	
10 : 0.5	95.90 ± 0.04[e]	-6.92 ± 0.03[a]	49.04 ± 0.04[a]	70.4 ± 0.8[a]
10 : 1.0	94.90 ± 0.02[c]	-6.03 ± 0.01[b]	50.72 ± 0.04[b]	70.0 ± 0.5[a]
10 : 1.5	94.85 ± 0.05[c]	-5.79 ± 0.00[c]	51.27 ± 0.06[c]	69.7 ± 0.6[a]
10 : 2.0	94.73 ± 0.02[b]	-5.48 ± 0.00[d]	51.42 ± 0.01[d]	69.7 ± 0.3[a]
10 : 2.5	94.68 ± 0.03[b]	-5.44 ± 0.01[e]	51.58 ± 0.03[e]	70.3 ± 0.7[a]
10 : 3.0	94.47 ± 0.06[a]	-5.08 ± 0.01[f]	51.74 ± 0.06[f]	69.9 ± 0.0[a]

* Mean value ± standard deviation (SD) from triplicate determinations.
a–f Means in a column followed by different superscript are significantly differences ($p < 0.05$).

Table 6. The changes of fried chicken color during frying with various oil to chicken ratios at 180 °C for 18 min

Ratio of oil : chicken drumsticks	color of fried chicken *		
	*L**	*a**	*b**
10 : 0.5	39.74 ± 0.78[a]	16.07 ± 0.27[a]	26.25 ± 0.59[c]
10 : 1.0	39.02 ± 1.21[a]	17.01 ± 0.81[a]	24.92 ± 1.58[bc]
10 : 1.5	38.28 ± 0.46[a]	16.69 ± 0.62[a]	22.57 ± 0.39[a]
10 : 2.0	38.67 ± 0.64[a]	16.12 ± 1.91[a]	23.89 ± 0.85[ab]
10 : 2.5	38.29 ± 0.42[a]	17.16 ± 0.03[a]	24.11 ± 0.38[ab]
10 : 3.0	38.86 ± 0.73[a]	16.89 ± 0.17[a]	22.72 ± 0.42[a]

* Mean value ± standard deviation (SD) from triplicate determinations.
a–c Means in a column followed by different superscript are significantly differences ($p < 0.05$).

from the retailers. Based on the color quality, frying at 180°C for 18 min was suitable condition for frying marinated chicken then this frying condition was selected to study the effect of the ratio of oil to chicken on oil quality deterioration in next step.

Effect of oil to chicken ratio on quality changes of oil and fried chicken

The effect of ratio of oil to chicken drumsticks on quality of used-fried oil was presented in Table 4. It was found that PV, FFA and *p*-AV increased significantly (p<0.05) with increasing proportion of oil to chicken drumstick. PV increased until ratio of oil to chicken was 10:1.5 afterward the value was not significantly difference. FFA content was slowly increased while *p*-AV rapidly increased from ratio 10:2.5 to 10:3.0. This may be the addition amount of marinated chicken in frying oil exhibited the similar effect as adding water, which the water had increased the hydrolysis to form free fatty acid (Fujisaki *et al*., 2001). Furthermore, water can also serve as a physical barrier by generating a steam blanket over the oil and preventing the contact between oxygen in the surrounding air and oil, resulting in oxidation of the oil increased with the formation of hydroperoxides in frying system (Saguy and Dana, 2003; Melton *et al*., 1994). Though, frying with lower proportion of oil to chicken ratio may prolong the quality changes in frying oil, it is not possible to apply in the commercial scale. Therefore, the highest ratio of oil to chicken (10:3.0) was selected to next study.

The changes of used-fried oil color and viscosity value were showed in Table 5. The color of the oil slightly darkened with higher proportion of chicken. Both lightness and greenness tended to decrease, while yellowness tended to increase. The viscosity of oil was not significantly change (p>0.05) with increasing ratio of oil to chicken drumsticks. The results showed little changes in both oil color and viscosity due to short time of frying.

For the fried chicken, there were not significant difference in *L** and *a** value, whereas *b** decreased significantly (p<0.05) with higher proportion of chicken (Table 6). It pointed out that color of fried chicken became darker which similar to the used-fried oil. These results agreed with Paul and Mittal (1996) who reported that the degradation of canola oil during frying had high correlation to the color of fried chicken products.

Effect of repeated frying on quality changes of chicken frying oil

The changes of PV, FFA and p-AV in repeated frying oil during frying chicken drumsticks for 30 batched within 1 day were presented in Table 7. The results showed that PV was significantly increased (p<0.05) with number of frying until 10 batches. The maximum of PV was 5.93±0.17 mg O2/kg fat at 10 batched of frying, then PV in the oil sample started to decrease. FFA and p-AV increased significantly (p<0.05) with increasing the number of repeated frying. The similar results also obtained when continue frying 10 batches a day for 3 day (Table 8). The PV was rapidly increased by the end of the first day frying. There were decreased after the maximum of 6.85 ± 0.40 mg O_2/kg fat in the second day of frying as a result of unstable compound as mentioned above. FFA increased with number of frying this is due to water, steam, and oxygen initiated the chemical reactions in the frying oil and food. Water, a weak nucleophile, attacks the

Table 7. Peroxide value, free fatty acid and p-anisidine value in frying oil during repeated frying for 30 batches/day

Number of frying	Peroxide value (mg O_2/kg fat)*	Free Fatty Acid (mg KOH/g fat)*	*p*-Anisidine value*
0	0.78 ± 0.08[a]	0.19 ± 0.00[a]	1.02 ± 0.16[a]
5	5.29 ± 0.08[d]	0.32 ± 0.00[b]	33.59 ± 0.14[b]
10	5.93 ± 0.17[g]	0.44 ± 0.00[c]	42.08 ± 0.43[c]
15	5.60 ± 0.16[e]	0.57 ± 0.02[d]	50.46 ± 0.43[d]
20	5.62 ± 0.08[f]	0.72 ± 0.01[e]	51.67 ± 0.52[e]
25	4.03 ± 0.14[c]	0.87 ± 0.00[f]	54.92 ± 0.42[f]
30	3.96 ± 0.05[b]	1.06 ± 0.02[g]	66.44 ± 0.95[g]

* Mean value ± standard deviation (SD) from triplicate determinations.
[a-g] Means in a column followed by different superscript are significantly differences (p<0.05).

Table 8. Peroxide value, free fatty acid and p-anisidine value in frying oil during repeated frying 10 batches/day for 3 days

Day	Peroxide value (mg O_2/kg fat)*	Free Fatty Acid (mg KOH/g fat)*	*p*-Anisidine value*
0	0.78 ± 0.08[a]	0.19 ± 0.00[a]	1.02 ± 0.16[a]
1	5.43 ± 0.02[c]	0.54 ± 0.02[b]	27.15 ± 0.53[b]
2	6.85 ± 0.40[d]	0.80 ± 0.12[bc]	41.24 ± 0.47[d]
3	4.58 ± 0.37[b]	1.05 ± 0.25[c]	37.89 ± 0.85[c]

* Mean value ± standard deviation (SD) from triplicate determinations.
[a-d] Means in a column followed by different superscript are significantly differences (p<0.05).

Table 9. Color and viscosity of frying oil during repeated frying for 30 batches/day

Number of frying	The color of frying oil*			Viscosity value* (cP)
	*L**	*a**	*b**	
0	97.77 ± 0.00[g]	-7.60 ± 0.00[a]	40.77 ± 0.06[a]	69.8 ± 0.8[a]
5	82.06 ± 0.08[f]	7.65 ± 0.06[b]	77.69 ± 0.02[e]	71.9 ± 0.1[b]
10	67.14 ± 0.04[e]	24.36 ± 0.01[c]	91.01 ± 0.04[g]	73.3 ± 0.3[bc]
15	53.40 ± 0.18[d]	34.45 ± 0.04[d]	86.18 ± 0.24[f]	74.7 ± 0.0[c]
20	44.50 ± 0.13[c]	38.68 ± 0.01[f]	74.71 ± 0.20[d]	76.2 ± 0.8[d]
25	35.66 ± 0.57[b]	40.41 ± 0.14[g]	60.86 ± 0.82[c]	78.6 ± 0.8[e]
30	24.80 ± 0.06[a]	38.54 ± 0.06[e]	42.64 ± 0.14[b]	86.4 ± 1.8[f]

* Mean value ± standard deviation (SD) from triplicate determinations.
[a-g] Means in a column followed by different superscript are significantly differences (p<0.05).

Table 10. Color and viscosity of frying oil during repeated frying 10 batches/day for 3 days

Day	The color of frying oil*			Viscosity value* (cP)
	*L**	*a**	*b**	
0	97.34 ± 0.01[d]	-7.09 ± 0.00[a]	41.76 ± 0.01[a]	69.2 ± 0.4[a]
1	76.15 ± 0.01[c]	17.16 ± 0.01[b]	94.69 ± 0.03[c]	70.7 ± 0.1[b]
2	59.72 ± 0.03[b]	34.68 ± 0.02[c]	89.27 ± 0.02[d]	72.8 ± 0.2[c]
3	48.23 ± 0.02[a]	42.23 ± 0.01[d]	81.24 ± 0.04[b]	73.2 ± 0.0[d]

* Mean value ± standard deviation (SD) from triplicate determinations.
[a-d] Means in a column followed by different superscript are significantly differences (p<0.05).

ester linkage of triacylglycerols and produces di- and monoacylglycerols, glycerol, and free fatty acids (Chung *et al*., 2004). The *p*-AV of repeated frying oil was significantly increased (p<0.05) with number of frying. However, p-AV of frying 10 batches a day for 3 consecutive days was lower than the frying 30 batches within 1 day.

The color and viscosity changes in repeated frying oil were showed in Table 9 and 10. Repeated frying 30 batches/day exhibited lower in *L**, *a** and *b** than repeated frying 10 batches/day for 3 days. The viscosity of all the oils increased with number of frying. Similar results were described by Sanchez-Gimeno *et al*. (2008) that viscosity of olive oil and high oleic sunflower oil using for frying potato at 180°C had increased with frying cycle. The comparison between two repeated frying processes indicated that the continued frying for 30 batches within 1 day gave darkened and viscosity of oil greater than continuous frying for 10 batches a day for 3 consecutive days. This could be explained by the effect of filtration helping to polish the fat by removal of charred batter. This can ruin the appearance of a fried product, contribute bitter flavor and darken the frying oil (Jacobson, 1991).

Conclusion

The frying temperature, time and ratio of oil to chicken drumsticks had significant affect on quality changes of frying oil and fried chicken. Frying at 180°C for 18 min provided the color similar to retailed fried chicken in Hat-Yai. The p-AV was significant increased as increasing portion of chicken, while PV and FFA were slightly changed. Moreover, the repeated frying for 30 batches within 1 day caused more oil deterioration than the continuous frying for 10 batches a day for 3 consecutive days.

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