

Physical and Nutritional Properties of Frankfurter where Chicken Fat is Substituted with Red Palm Fat

Wan Rosli W.I, Wan Sulaiman W.I, Alina A.R., Babji A.S.¹ and Foo S.P.²

¹School of Chemical Sciences and Food Technology, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, Bangi, 43600 Selangor, Malaysia. ²Carotino Sdn. Bhd., Pasir Gudang, Johor, Malaysia.

Background

This research was undertaken to explore the nutritional and functional benefits of red palm fat as a substitute for chicken fat in frankfurters. Chicken fat is high in cholesterol (often associated with heart diseases) and unsaturated fatty acids (which easily oxidised and lead to product rancidity). The American Heart Association and other health groups have strongly recommended a reduction in the consumption of animal fat intake. The situation is critical in Australia where 50% of male adults and 30% of female adults are classified as obese. Experts have recommended a drastic reduction of fat from 40% to 30% for calorie intake per day and saturated fat be reduced to from 18% to 10% (Carroll, 1998). Red palm oil has been reported to be good for health. Yap et al (1991) noted that β -carotene contained in red palm oil acts to prevent certain type of cancers. Red palm oil also contained high vitamin E which acts as antioxidant in biological system (Goh 1998).

Keywords : chicken frankfurter, red palm fat, carotene, vitamin A & E, RDA

Objective

The objective of this study is to develop an animal fat substitute as a new designer food ingredient naturally fortified with vitamins, antioxidants and is cholesterol free (relative to animal fats) for usage in the processed meats such as chicken frankfurter.

Methods

Treatment formulations consist of Chicken Fat (CF), Palm Fat (PF) and Red Palm Fat (RF) at a fixed level of fats (9.5%). Carotene content was based on methods from PORIM (1995), vitamin E was adapted from AOCS (1989). The nutritional content of vitamin A and E were referred to 1989 Recommended dietary allowances (RDA)'s table. Percentage nutritional content of vitamin A and E in all treatments were Calculated as follow:

Carotenes (mg) = wt. of product (kg) X % fat X carotene content (ppm)

%USRDA of vitamin A = (Carotenes (mg)/7.2283 mg) X 100 (where 7.2283 mg carotenes = 100% RDA for male adult)

Vitamin E (mg) = wt. of product (kg) X % fat X Vitamin E (ppm)

%USRDA of vitamin E = (Vitamin E (mg)/10) X 100 (where 10 mg vitamin E = 100% RDA for male adult).

Colour ('L', and 'b') of sausages were recorded using a Minolta Chromameter Model CR-300. Shear value of cooked franks was measured using Stephen Farnell QTS machine. Data obtained were tested for significance using ANOVA and Duncan Multiple Range Test with SAS.

Result and Discussion

The vitamin E content was highest in RF franks, followed by PF and CF treatments at 447, 392 and 77 ppm respectively. RF treated franks had the highest carotene values while PF had the lowest (Table 1). The RDA percentage of vitamin A was highest in RF franks (37.07%) followed by CF and PF at 18.54 and 2.37 % respectively. Red palm fat and palm fat also provide a higher amount of vitamin E which accounted for 127.40 % and 111.70 % respectively compared to chicken fat at 21.90 % RDA (Table 2).

Table 1 : Carotene and vitamin E content of chicken frankfurter treated with chicken fat (CF), palm fat (PF) and Red palm fat (RF)

(ppm)*	Chicken Fat (CF)	Palm Fat (PF)	Red Pal Fat (RF)
Carotene	47 ^y	6 ^z	94 ^x
Alpha-Tocopherol	77	100	106
Alpha-Tocotrienol	0	82	112
Gamma-Tocotrienol	0	177.5	192
Delta-Tocotrienol	0	32.5	37
Vitamin E (average)	77 ^z	392 ^y	447 ^x

^{x-y} : Means within the same row with different superscript letters are significantly different (P<0.05)

Table 2 : Percent RDA of vitamin A and E in pack size 300 g of chicken frankfurter treated with 9.5% chicken fat, palm fat and red palm fat

	Chicken Fat (CF)	Palm Fat (PF)	Red Palm Fat (RF)
Carotene (mg)	1.34	0.17	2.68
% RDA of vitamin A	18.54	2.37	37.07
Vitamin E (mg)	2.19	11.17	12.74
% RDA of vitamin E	21.90	111.70	127.40

Substituting palm fats in the products yielded stable color values comparable to the control treatment. The yellowness of red palm franks showed higher values after the 3 months of frozen storage (Table 3). Fading is a major problem with cured meat products during refrigerated display and storage, often caused by exposure to light and oxygen. Addition of red palm fat improved the color of chicken franks, especially with an increase in the yellowness intensity (b value).

Table 3 : Lightness(L) and yellowness(b) of chicken franks as influenced by the addition of chicken fat and red palm fat

	Month	Chicken Fat (CF)	Palm Fat (PF)	Red Palm Fat (RF)
Lightness, L	0	^x 72.26 C	^{xy} 75.36 A	^x 74.37 AB
	1	^y 70.58 C	^{xy} 75.45 A	^z 71.70 B
	2	^x 71.30 BC	^y 74.73 A	^{yz} 72.75 B
	3	^x 72.25 BC	^x 72.75 A	^{xy} 73.72 B
Yellowness, b	0	^x 15.26 C	^y 16.11 B	^y 35.99 A
	1	^y 14.19 C	^x 17.10 B	^y 36.92 A
	2	^x 15.23 C	^x 16.84 B	^x 37.56 A
	3	^x 15.05 C	^x 18.28 B	^x 38.39A

A-C : Means within the same row with different uppercase letters are significantly different (P<0.05)

^{x-z} : Means with the same column with different superscript lowercase letters are significantly different (P<0.05)

The texture of frankfurters were not significantly different, with palm fat and red palm fat being slightly softer than chicken fat (Table 4). Frozen storage at -18°C for 3 months showed no significant changes for all 3 treatments.

Table 4 : Hardness of chicken franks as influenced by the addition of palm fat and red palm fat

	Month	Chicken Fat (CF)	Palm Fat (PF)	Red Palm Fat (RF)
Hardness (g)	0	^x 578.00 AB	^y 461.00 C	^y 485.50 BC
	1	^w 1122.00 A	^x 969.50 B	^w 1203.75 A
	2	^y 417.00 A	^z 270.50 B	^z 354.50 AB
	3	^x 672.75 A	^x 692.25 A	^x 632.25 A

A-C : Means within the same row with different uppercase letters are significantly different (P<0.05)

^{w-z} : Means with the same column with different superscript lowercase letters are significantly different (P<0.05)

Conclusion

This study showed the potential of substituting chicken fat with palm fat and red palm fat in chicken frankfurter formulation. Improvements in physical and nutritional properties were observed. Color retention for yellowness was significantly contributed by red palm fat. Red palm fat and palm fat generally resulted in softer chicken frankfurters, compared to chicken fat. Nutritional components such as carotenes and vitamin E are unusually high, proving the benefits of palm fat/red palm fat usage in the chicken frankfurter formulation.

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