

REPLACEMENT OF ANIMAL FAT WITH FRACTIONATED PALM OIL IN BEEF BURGERS

Babji, A.S., Alina, A.R., Seri Chempaka, M.Y. *Sharmini, T., *Basker, R. and *Yap, S.L. Dept. of Food Science and Nutrition, Faculty of Life Sciences, Universiti Kebangsaan Malaysia, *Olinco (M) Sdn.Bhd., Port Klang, Selangor.

Introduction

Animal fat, an important source of food energy and of fat soluble vitamins, is added to meat products for economic, flavour and texture reasons (Rakosky, 1970). Due to the cholesterol and saturated fatty acid content of meat products, their inclusion in a healthful diet is controversial (Marquez et al, 1989). To generate products with reduced fat and calories while retaining traditional full-fat flavour and texture, a substantial amount of animal fat could be modified or changed by substituting other sources of fat containing unsaturated fatty acids such as vegetable oils for some of the animal fats during processing (Rhee, 1992). This study was carried out to monitor the effects on sensory properties and consumers' acceptance in beef burgers based on changes in textural qualities, solid fat content, slip melting point and cooking loss when beef fat is replaced with vegetable fat.

Materials and Methods

Four formulations of beef burgers at 15% level of fat consisting of palm stearin, socfat 4000P(SF4000P), socfat 4100P(SF4100P) and beef fat as control were evaluated for SFC (solid fat content using pulsed NMR) and SMP (slip melting point) using AOCS method. Cooking loss and Thiobarbituric Acid (TBA) values were done using the AOAC methods (1990). Texture profile analysis (TPA) of burgers were measured using Steven Farnell Quality Texture System (probe type- punch assembly, speed 60mm/s, compression 60% original height, two-cycle compression test on samples 2.5cm diameter, 1 cm thick). Sensory evaluation was carried out on 60 panelists using a 7 scale hedonic test.

Results and Discussion

SFC and SMP (Table 1 and 2) for raw and cooked beef burgers were the lowest at 40°C with SF4000P value for SFC and SMP being the closest with the control burgers. At the range of 35 - 40°C which equate our body temperature, SF4000P had the closest resemblance to beef fat. Higher percentage of SFC in this range means excess fat that will not melt in the mouth, leaving unwanted greasy and waxy mouthfeel which may affect consumers acceptance. Sensory evaluation (Table 4) for oiliness of SF4000P and SF4100P in comparison with control burgers did not show any significant differences ($P>0.05$). Palm stearin burgers had the least oily taste for the sensory evaluation test, which may be due to the highest cooking loss value. Cooking loss for SF4000P, SF4100P and control beef burgers indicate no significant difference (Table 3). TBA values of SF4000P was the highest at 0.887, followed by beef fat, palm stearin and SF4100P at 0.869, 0.768 and 0.793 respectively. Objective textural measurements through the Texture Profile Analysis (TPA) for all cooked burgers formulations at room temperature showed no significant differences for springiness and cohesiveness. Variation of values among the formulations on TPA for hardness, gumminess and chewiness may be explained by the differences of SFC for beef burgers with various types of fats at 25°C. However, sensory evaluation on the attributes for texture, juiciness, aroma, and overall values for all formulations indicate no significant difference, panelists could not differentiate burgers with substituted vegetable fats against the control beef fat burgers.

Conclusion

This study showed SF4000P as a potential beef fat substitute in beef burgers based on the SFC, SMP and overall taste panel acceptance. Further studies with Olinco Sdn. Bhd. will be on improving the texture of Socfat in terms of hardness and adding beef flavour to improve sensory acceptance of the animal fat substitutes.

References

- 1) AOAC. 1990. Official Methods of Analysis. 15th ed., Washington, DC.
- 2) AOCS, 1992. Olinco (M) Sdn. Bhd.
- 3) Marquez, E., Ahmed, E.M., Shireman, R.B., Cornell, J.A., and West, R.L. 1989. Dietary effects of frankfurters with added beef fat and peanut oil. *J. Food Sci.* 54(3):497.
- 4) Rakosky, J. 1970. Soy products for the meat industry. *J. Agr. Food Chem.* 18: 1005.
- 5) Rhee, K.S. and Smith, S.G. 1982. Effect of cooking on cholesterol content of patties containing different amounts of beef, texture soy protein and fat. *J. Food Sci.* 48: 268.

Table 1: Solid Fat Content (Pulsed NMR) for four beef burgers formulations*

Temp °C	Raw Beef Burgers				Cooked Beef Burgers			
	beef fat	SF4000P	SF4100P	Palm stearin	beef fat	SF4000P	SF4100P	Palm stearin
10	48.34 ^b	40.54 ^d	57.40 ^a	44.00 ^c	42.84 ^b	43.88 ^b	52.63 ^a	42.55 ^b
20	31.98 ^b	22.45 ^d	37.33 ^a	26.27 ^c	25.61 ^b	24.53 ^b	35.80 ^a	23.68 ^b
25	22.15 ^b	15.11 ^d	25.93 ^a	18.58 ^c	18.24 ^b	16.85 ^b	25.16 ^a	17.16 ^{bc}
30	15.05 ^b	9.92 ^c	17.32 ^a	13.61 ^b	12.32 ^b	12.18 ^b	17.58 ^a	12.25 ^b
35	7.91 ^c	5.44 ^d	10.31 ^a	9.21 ^b	5.05 ^b	5.29 ^b	10.41 ^a	7.80 ^b
40	1.82 ^c	1.01 ^d	3.76 ^b	5.21 ^a	0.45 ^b	0.97 ^b	2.85 ^b	4.47 ^a

*Mean values of three samples with superscript are significantly different ($P < 0.05$).

Table 2: Slip Melting Point (°C)*

Raw Beef Burgers				Cooked Beef Burgers			
beef fat	SF4000P	SF4100P	Palm stearin	beef fat	SF4000P	SF4100P	Palm stearin
39.00 ^b	40.70 ^a	39.25 ^b	40.75 ^a	38.35 ^b	39.20 ^b	42.00 ^a	41.25 ^a

*Mean values of three samples with superscript are significantly different ($P < 0.05$).

Table 3 : Cooking Loss and TPA for beef burgers*

		beef fat	SF4000P	SF4100P	Palm Stearin
Cooking Loss (%)		18.44 ^b	18.33 ^b	18.69 ^b	20.74 ^a
Texture Profile Analysis (TPA)	Hardness (g)	9677.0 ^a	7440.7 ^b	6954.7 ^b	6147.0 ^c
	Gumminess (g)	3035.6 ^a	1862.5 ^c	1986.8 ^{bc}	2489.8 ^b
	Chewiness	19604.4 ^a	11438.5 ^c	11775.6 ^c	15007.4 ^b
	Springiness (mm)	6.45 ^a	6.11 ^a	5.96 ^a	6.00 ^a
	Cohesiveness	0.31 ^{ab}	0.25 ^b	0.29 ^b	0.40 ^a

*Mean values of three samples with superscript are significantly different ($P < 0.05$).

Table 4 : Sensory evaluation on four beef burgers formulations*

Attributes	beef fat	Palm stearin	SF4000P	AF4100P	Commercial brand
Texture	3.98 ^b	3.86 ^b	4.00 ^b	3.62 ^b	5.14 ^a
Juiciness	3.54 ^b	3.62 ^b	3.82 ^b	3.36 ^b	4.60 ^a
Aroma	4.22 ^b	4.66 ^{ab}	4.38 ^{ab}	4.72 ^{ab}	5.12 ^a
Oiliness	3.58 ^{ab}	3.18 ^b	3.42 ^{ab}	4.64 ^a	3.80 ^a
Overall acceptance	3.64 ^b	3.74 ^b	4.00 ^a	3.48 ^b	5.40 ^a

*Mean values of three samples with superscript are significantly different ($P < 0.05$).