



EFFECTS OF BLENDING CHICKEN BY-PRODUCTS WITH PALM FAT OXIDATION AND SENSORY PROPERTIES OF CHICKEN BOLOGNA DURING FROZEN STORAGE (-18°C)

Wolyna, P. and Babji, A. S.

Food Science Programme, School of Chemical Science and Food Technology,
Faculty of Science and Technology, Universiti Kebangsaan Malaysia,
43600 Bangi, Selangor, Malaysia.

Background

Traditional meat products are commonly associated with high fats and cholesterol. As cholesterol and unhealthy PUFA / SFA ratios are adversely related to coronary heart disease (Muguerza et. al 2001), it is only prudent for meat producers in the food industry to offer less cholesterol / less fats processed meats to the consumer. Some meat processing methods such as pre-emulsion, blending vacuum chopping and tumbling of poultry by-product such as mechanical deboned chicken meat (MDCM), spent hen meat and chicken trimming have been efficiently utilized as raw materials in the production of emulsion-type, value added, meat products (Seri Chempaka et. al 1996). Palm fats were successfully incorporated in some meat product formulations on a direct weight per weight substitution with animal fats (Babji et. al 2001).

Objectives

The purpose of this work was to study the utilization of chicken by-products and palm shortening on the TBA value and sensory properties of chicken bologna stored as frozen (-18°C).

Materials and methods

Chicken bologna was produced using 45% mechanical deboned chicken meat, 30% spent hen meat and 15% chicken trimming. Five chicken bologna formulations containing 10% of various fats were studied. Chicken fat was used as the control formulation (C), red palm fat (T1), 1:1 combination of chicken fat and red palm fat (T2), white palm fat (T3) and 1:1 combination of chicken fat and white palm fat (T4).

Thiobarbituric Acid (TBA) Test

The development of oxidative rancidity was measured by distillation method of Tarladgis et al. (1960).

Sensory Evaluation

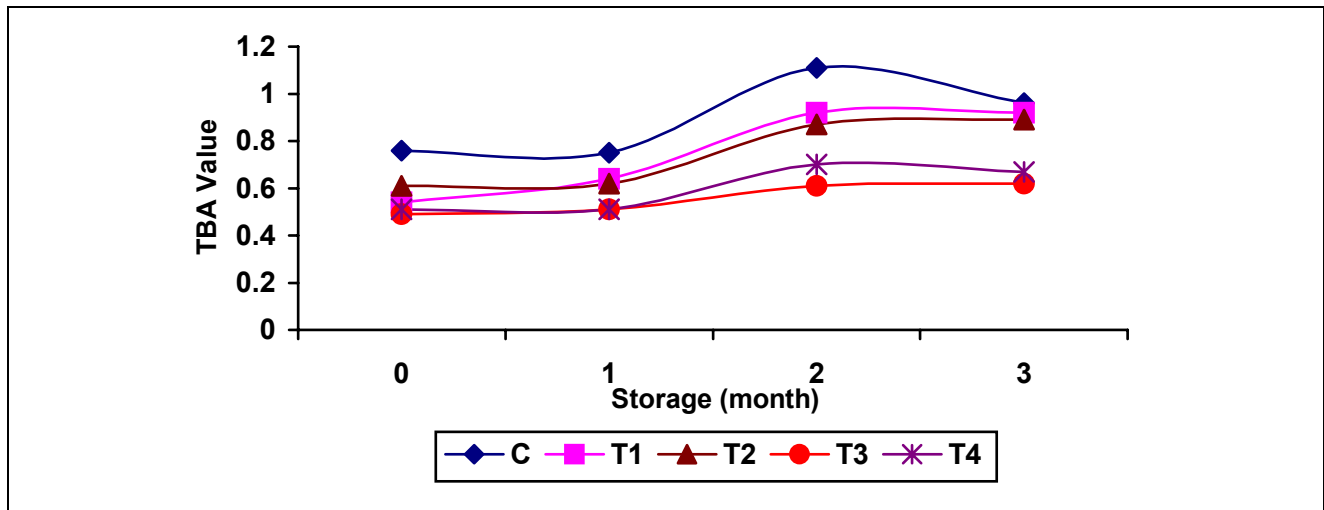
Sensory evaluation was carried out by panel consisting of students and staff of the Department of Food Science and Nutrition, Universiti Kebangsaan Malaysia; 60 panelists altogether. The sensory technique adopted was hedonic test using a seven-point scale. Attributes evaluated included colour, aroma, hardness, springiness, juiciness, oiliness, chicken flavour, off-flavour and overall acceptability. Samples were presented in sample cups coded with 3 digit random numbers and were presented to panelists using random numbers of permutation. Sensory evaluation was conducted in a Sensory Evaluation Laboratory equipped with six isolated booths (School of Chemical Science and Food Technology, Universiti Kebangsaan Malaysia).

Data were subjected to analyses of variance (ANOVA), using the SAS package software (SAS, 1985).

Results and discussion

Thiobarbituric Acid Value (TBA)

Over the entire storage period (3 months), the TBA values of chicken bologna prepared with chicken fat (CF) was higher than those with red palm fat (RPF) and palm fat (PF) (Figure 1). It was clearly shown that the incorporation of red palm fat (RPF) and palm fat (PF) had reduced the TBA values of bologna compared to chicken fat (CF). Substitution of palm fat (PF) in formulation T3 and T4 gave significant differences ($P<0.05$) for the TBA value, when compared to the control formulation (C). Whereas, no significant difference was observed in TBA value between control formulation (C), T1 and T2 ($P>0.05$). Generally, the TBA values of chicken bologna decreased after 3 months of frozen storage ($P<0.05$).



(C= 100%CF; T1=100%RPF; T2=50%CF+50%RPF; T3=100%PF; T4=50%CF+50%PF)
CF : Chicken Fat RPF :Red Palm Fat PF : Palm Fat

Figure 1: Thiobarbituric Acid Values of Chicken Bologna Stored at -18°C for 3 months.

Sensory Evaluation

Mean scores for various sensory attributes are shown in Table 1. Storage as frozen did not significantly affect ($P>0.05$) consumer acceptance for attributes such as colour, aroma, hardness, springiness, juiciness, oiliness, chicken flavour, off-flavour and overall acceptance for the chicken bologna. Consumer test showed no significant differences ($P>0.05$) between formulation for attributes such as colour, hardness, springiness and oiliness. It was observed that bologna prepared with red palm fat, namely, T1 and T2, received very low sensory score and these scores were significantly lower than control formulation (C) in the chicken flavour rating at the 3 months of storage ($P<0.05$). Bologna prepared with CF was most accepted by the consumer both in chicken flavour and off flavour attributes. However, there were no significant differences ($P>0.05$) between formulations in terms of off flavour attributes at 3 months of storage. The control formulation (100%CF) had the highest scores for the overall acceptance. The study showed that substitution of palm fat (PF) into formulation T3 and T4 in terms of overall acceptance was not significantly different from that of the control formulation (100% CF). Whereas the incorporation of red palm fat (RPF) into chicken bologna, T1 and T2 showed an overall acceptance scores that were significantly different ($P<0.05$) compared to the control formulation (C). The overall acceptance scores were highly correlated to the chicken flavour ($r = 0.89$, $P<0.05$) and springiness ($r = 0.98$, $P<0.05$).



Table 1: Means for Various Sensory Attributes of Chicken Bologna Stored at -18°C for 3 months.

Attributes	Storage Time (Month)	Treatment				
		C	T1	T2	T3	T4
Colour	0	^x 4.20 ^a	^x 3.97 ^a	^x 4.47 ^a	^x 4.08 ^a	^x 4.25 ^a
	3	^x 4.25 ^a	^x 4.07 ^a	^x 4.30 ^a	^x 4.45 ^a	^x 4.18 ^a
Aroma	0	^x 4.65 ^a	^x 4.18 ^{ab}	^x 4.42 ^{ab}	^x 4.17 ^b	^x 4.23 ^{ab}
	3	^x 4.30 ^a	^x 4.23 ^a	^x 4.42 ^a	^x 4.58 ^a	^x 4.17 ^a
Hardness	0	^x 4.55 ^a	^x 4.55 ^a	^x 4.35 ^a	^x 4.33 ^a	^x 4.62 ^a
	3	^x 4.60 ^a	^x 4.32 ^a	^x 4.18 ^a	^x 4.42 ^a	^x 4.52 ^a
Springiness	0	^x 4.55 ^a	^x 4.17 ^a	^x 4.27 ^a	^x 4.38 ^a	^x 4.42 ^a
	3	^x 4.40 ^a	^x 4.28 ^a	^x 4.30 ^a	^x 4.35 ^a	^x 4.55 ^a
Juiciness	0	^x 4.65 ^a	^x 4.20 ^a	^x 4.35 ^a	^x 4.25 ^a	^x 4.22 ^a
	3	^x 4.63 ^a	^x 4.05 ^b	^x 4.25 ^{ab}	^x 4.23 ^{ab}	^x 4.35 ^{ab}
Oilliness	0	^x 4.55 ^a	^x 4.20 ^a	^x 4.23 ^a	^x 4.25 ^a	^x 4.40 ^a
	3	^x 4.72 ^a	^x 4.25 ^a	^x 4.32 ^a	^x 4.32 ^a	^x 4.37 ^a
Chicken Flavour	0	^x 4.75 ^a	^x 4.37 ^{ab}	^x 4.27 ^b	^x 4.55 ^{ab}	^x 4.50 ^{ab}
	3	^x 4.68 ^a	^x 4.02 ^b	^x 4.12 ^b	^x 4.43 ^{ab}	^x 4.48 ^{ab}
Off-Flavour	0	^x 4.32 ^a	^x 3.80 ^b	^x 3.95 ^{ab}	^x 4.03 ^{ab}	^x 3.83 ^{ab}
	3	^x 4.08 ^a	^x 3.75 ^a	^x 3.97 ^a	^x 3.92 ^a	^x 4.03 ^a
Overall Acceptability	0	^x 4.68 ^a	^x 4.20 ^b	^x 4.08 ^b	^x 4.50 ^{ab}	^x 4.45 ^{ab}
	3	^x 4.77 ^a	^x 4.08 ^b	^x 4.27 ^b	^x 4.32 ^{ab}	^x 4.47 ^{ab}

^{a-b}Mean values within the same row bearing different superscripts differ significantly (P<0.05)

^{x-z}Mean values within the same column bearing different superscripts differ significantly (P<0.05)

C = (100% CF), T1 = (100%RPF), T2 = (50%CF + 50% RPF), T3 = (100% PF),
T4 = (50%CF + 50% PF)

Conclusions

This study pointed out the potential of palm oil product, especially palm fat (PF), to be used as fat sources in the production of comminuted meat products. The results also indicated that incorporation of palm fat did not adversely affect the sensory rating attributes of bolognas. In the storage study, bologna containing red palm fat (RPF) and palm fat (PF) showed lower TBA values than bologna with 100% chicken fat. This study indicated that addition of red palm fat and palm oil resulted in chicken bologna with better sensory properties and lower TBA values, when combined with MDCM, spent hen meat and chicken trimming.

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EFFECT OF ADDING TURMERIC AND LEMON GRASS DURING MARINATION ON THE QUALITY OF ROASTED CHICKEN

Babji, A.S., Hui Vern, N., S. E. Ch'ng, C. L. Siaw

School of Chemical sciences and Food Technology
University Kebangsaan Malaysia
43600 Bangi, Selangor, Malaysia

Background

Today's consumer is looking for easy-to-prepare, juicy and tasty products. Marination is an excellent way to turn ordinary and less value meat cuts into succulent food products. Marinating not only adds value to cheaper cuts, but also creates new products with specific taste profile: Rhizome *Cucurma longa*, turmeric have been reported to exhibit antioxidative activity (Toda et al 1985), while Uhl (2000) noted antimicrobial effect of lemon grass, *Cymbopogon citratus* used in marinades of meat and roast chicken.

Objectives

This study monitored the antioxidative and sensory properties of turmeric and lemon grass extracts in marinated roasted chicken.

Materials and methods

Freshly slaughtered broilers and hen carcasses were deboned and the breast meat was separated and kept frozen at -18°C until used for marination. The formulations were indicated in Table 1.

Table 1. Formulation of five treatments of marinades for boiler meat and spent hen meat.

Ingredients	C1 (%)	C2 (%)	C3 (%)	C4 (%)	C5 (%)
Salt	8.00	8.00	8.00	8.00	8.00
Sodium Nitrite	0.08	0.08	0.08	0.08	0.08
Sodium Erythroate	0.30	0.30	0.30	0.30	0.30
Sodium tripolyphosphate	1.50	1.50	1.50	1.50	1.50
Sugar	5.50	5.50	5.50	5.50	5.50
Citric acid	0.60	0.60	0.60	0.60	0.60
Curry powder	5.00	5.00	5.00	5.00	5.00
Meat tenderizer	-	3.00	3.00	3.00	3.00
Turmeric	-	-	3.00	-	1.50
Lemon grass	-	-	-	3.00	1.50
Water	79.02	76.02	73.02	73.02	73.02
Total	100.00	100.00	100.00	100.00	100.00

Marination involved soaking of chicken breast meat (200g) with skin in treated marinades at 4°C for 0, 8 and 24 hours. After marination, the samples were kept at 4°C for 24 hours, then roasted using a microwave oven.

TBA value was determined using the method by Tarladgis et al (1960).

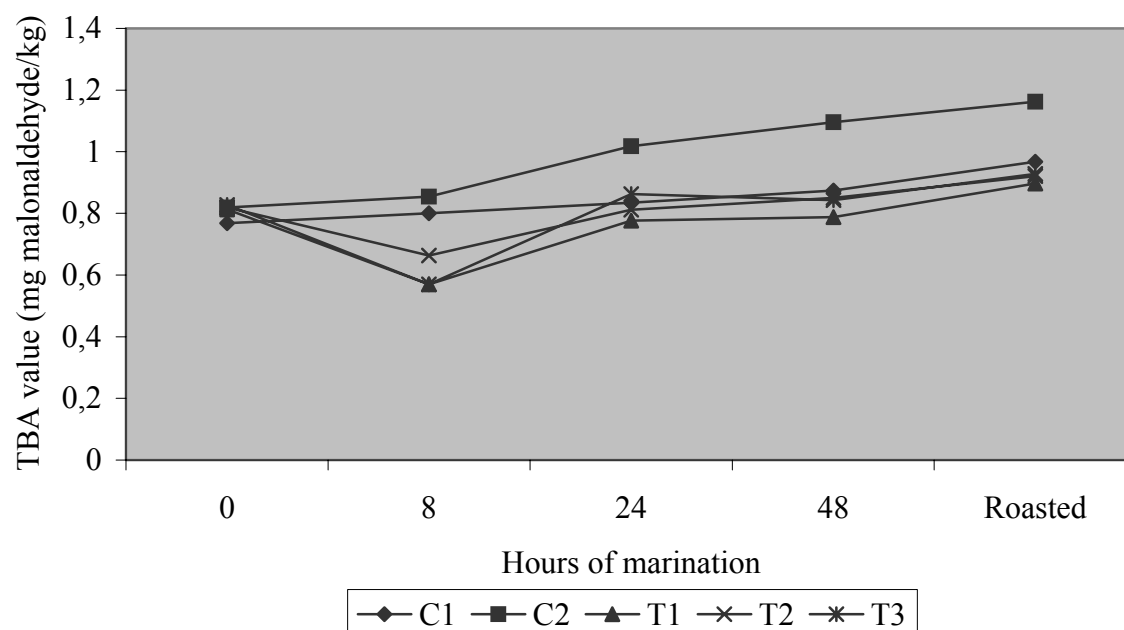
Sensory evaluation was carried out using the Hedonic Scale of 1= lowest, and 7= highest for scoring various attributes. A panel of 50 people was used to evaluate color, aroma, taste, juiciness, tenderness and overall acceptance of the samples.

Statistical analyses were done on the results using SAS, 1985 with Duncan test to differentiate among treatment at P< 0.05.



Results and discussion

Results of TBA test indicated a significant ($P < 0.05$) decrease for marinated chicken treated with tumeric, lemon grass and combination of tumeric and lemon grass for spent hen, particularly after 8 hours of marination (Figure 1). The two control samples of spent hen and broiler meat had increased TBA values throughout the 48 hours of marination. The antioxidative effect was probably contributed by natural compounds such as curcumin and citral present in tumeric and lemon grass respectively (Priyadarsini, 1997)



C1: Control (Broiler Meat)

C2: Control (Spent hen)

T1: Spent hen + tumeric

T2: Spent hen + Lemon grass

T3: Spent hen + tumeric: lemon grass (1:1)

Figure 1. Changes in TBA values (mg malonaldehyde/kg) for five formulations of marinated chicken meat at various time of marination and roasting.

Table 2 showed the sensory scores of color, odour, taste, texture, juiciness and overall acceptance of four treatment of marinated spent hen meat and two treatments of unmarinated broiler and spent hen meat respectively. Addition of tumeric and lemon grass and combination of these spices resulted in increase in the overall acceptance of roasted spent hen compared to control spent hen. However, the control broiler chicken was softer and more juicy compared to marinated spent hen meat. Marination with tumeric, lemon grass and combination of these two spices increased consumer acceptance for the softness and juiciness of spent hen meat when compared to the control spent hen meat. There were significant differences ($P < 0.05$) for softness for lemon grass and combination of lemon grass and tumeric, when compared to the control non marinated spent hen meat. The problem of toughness with spent hen meat still remained, due to inherent accumulation of connective tissue in older bird. (Roland et al, 1981).



Table 2. Sensory evaluation using hedonic scale of 1= most dislike and 7= most acceptable of five marinated chicken breast meat.

Attributes	Formulation				
	C1	C2	T1	T2	T3
Color	4.20 ^{AB}	4.60 ^{AB}	4.72 ^A	4.24 ^{AB}	4.08 ^B
Odor	4.66 ^A	4.32 ^A	4.18 ^A	4.52 ^A	4.44 ^A
Taste	4.44 ^A	3.82 ^B	3.98 ^{AB}	4.14 ^{AB}	3.98 ^{AB}
Softness	4.62 ^A	3.00 ^C	3.36 ^{BC}	3.64 ^B	3.90 ^B
Juiciness	4.34 ^A	3.34 ^B	3.74 ^B	3.66 ^B	3.84 ^{AB}
Overall acceptance	4.52 ^A	3.62 ^B	3.94 ^B	4.12 ^{AB}	4.10 ^{AB}

Mean score n=50

^{A-D}: Means with different superscript for row are significantly different (p<0.05).

C1- Control (Broiler Meat)

C2-Control (Spent Hen)

T1-Spent Hen + tumeric

T2-Spent Hen + Lemon grass

T3-Spent Hen + combination of lemon grass and tumeric (1:1)

Conclusions

Tumeric and lemon grass added to marinades were effective in reducing oxidation in hen meat. Addition of tumeric and lemon grass and their combination in marinades also resulted in improving consumer acceptance of the roasted spent hen breast meat.

References

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