OXIDATIVE STABILITY OF THIGH MEAT FROM BROILERS FED OXIDIZED POULTRY OFFAL FAT

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Background

Lipid oxidation in meat systems is the main cause of quality deterioration and low acceptability of meat and meat products (BUCKLEY *et al.*, 1995; GRAY *et al.*, 1996). Development of lipid oxidation in meat is influenced by many factors such as dietary fat content and quality, fatty acid profiles in muscle, balance between muscle pro-oxidants and antioxidants, degree of processing and storage conditions (JENSEN *et al.*, 1998). The effects of feeding oxidized diets to broiler chickens are known and are related to poor perfomance (CABEL *et al.*, 1988; ENGEBERG *et al.*, 1996) and depleted oxidative stability of white and dark meat (ASGHAR *et al.*, 1989; LIN *et al.*, 1989, GRAU *et al.*, 2001).

Objectives

The objective of this study was to evaluate the effects of dietary oxidized poultry fat on oxidative stability of chicken dark meat (thigh) during chilled storage for 12 days.

Methods

Fresh poultry fat (FPF) was supplied by local rendering and then stored frozen (-18°C) until diets were produced. Oxidized poultry fat (OPF) was obtained by heating (110 to 120°C) in an electric fryer for 21 days. Periodically, samples were taken from FPF and OPF and analysed to monitor its quality. Moisture, acid value, ether extract and peroxide value were measured according to the methods described by COMPENDIO (1998). Specific absorbances were measured in fat samples to quantify oxidation products using IUPAC method number II.D.23 (1979).

One hundred and twenty male chicks were raised in floor pens and fed a corn-soy diet diet containing 4% of fresh or oxidized poultry fat from 10 to 47 days of age. Sixty birds from each treatment were slaughtered at 47 days of age and skinless and boneless thigh meat were stored chilled (0.7 to 4.8°C) during 12 days. Meat samples were collected frequently (day 1, 4, 8 and 12) to assess quality and oxidative stability. TBARS (Thiobarbituric-acid reactive substances) were measured in duplicate of 3 thighs of each treatment on days 1, 4, 8 and 12 of storage according to the method described by TARLADGIS *et al.* (1960).

Results and Discussion

In **Table 1** is presented composition and quality aspects of FPF and OPF. Peroxide value obtained for OPF samples was 14 times higher than for FPF samples and specific absorbances obtained for OPF fat increased 4 and 6 times at 232 and 270 nm, respectively, during oxidation process when compared to values obtained for FPF. These results indicated the presence of high amounts of oxidation compounds (peroxides and conjugated dienes) as a consequence of lipid oxidation.

Although birds were fed 4% of highly oxidized poultry fat in the diet, no influence was observed on animal performance comparing to birds fed fresh poultry fat. Means of feed:gain rate, live weight (kg) and feed intake (kg) were 1.76, 2.69 and 4.26, respectively, for birds fed OPF and 1.79, 4.35 and 2.70, respectively, for birds fed FPF. Birds fed OPF had consumed almost the same amount and reached the same weight as birds fed FPF which means that lipid oxidation induced in poultry fat used in this experiment was not enough to decrease animal performance.

Oxidative changes in thigh meat during chilled storage are presented in **Table 2**. TBARS values were statistically higher (P=0.0016) for OPF (0.65 mg MAD/kg sample) when compared to FPF (0.49 mg MAD/kg sample). Meat from broilers fed OPF stored chilled for 12 days resulted in lower stability shown by increased TBARS values. Similar results were found before (ASGHAR *et al.*, 1989; LIN *et al.*, 1989; JENSEN *et al.*, 1997) as a consequence of feeding broilers with highly oxidized diets.

Conclusions

1) In this study, feeding broilers with 4% of OPF from 10 to 47 days of age did not affect animal performance.

2) Although stability of broiler thigh meat was depressed during chilled storage due to the consumption of oxidized poultry offal fat added to the diet.

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Tables

Table 1. Characterization of fresh (FPF) and oxidized (OPF) experimental fat.

Analyses	Units	FPF	OPF
Moisture	%	0.53	0.48
Acid Value	mg NaOH/g	1.22	1.73
Ether Extract	%	99.05	99.72
Peroxide Value	meq O_2/kg	2.83	38.73
Specific absorbances			
232 nm		2.86	10.53
270 nm		0.32	1.97

Table 2. Thiobarbituric acid-reactive substances (TBARS) measured in thigh meat of broilers fed fresh (FPF) or oxidized poultry fat (OPF) stored chilled during 12 days of storage.

Treatment	TBARS (mg MDA/kg sample)					
	Day 1	Day 4	Day 8	Day 12	Average	CV[1](%)
FPF	0.379	0.535	0.473	0.580	0.492[b]	20.95
OPF	0.560	0.701	0.720	0.633	0.654[a]	17.90

[1] CV = Coeficient of Variation

[ab] Means in the same column with no common superscript differ (P=0.0016) using t test