

EFFECTS OF DIETARY ETHIOPIAN PEPPER ON OXIDATIVE STABILITY OF REFRIGERATED BROILER CHICKEN MEAT

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ABSTRACT

A worldwide concern in the use of synthetic antioxidant in food safety necessitates investigation into natural sources of antioxidants. Ninety six days old Anak broiler chickens were used to investigate the effect of dietary Ethiopian pepper on oxidative stability of refrigerated raw and cooked broiler chicken meat. The birds were fed the starters diet for the first four weeks after which the birds were weighed and allotted into four treatments of two replicates with 12 birds per replicate. The birds were given tested diet with Ethiopian pepper inclusions levels of 0, 10, 20 and 30g/kg feed for another four weeks trial period. At the end of the 8th week, four birds per treatment (a total of 20) were taken for slaughtering, evisceration and meat processed and refrigerated for raw and cooked meat lipid oxidation assessment. Results showed that Ethiopian pepper inclusion in broiler diet exerted no antioxidant effect on refrigerated raw broiler meat however it proved to be a good natural antioxidant in refrigerated cooked broiler meat.

Keywords: Antioxidant, Broiler, Ethiopian pepper.

INTRODUCTION

There is interest in meat containing higher level of polyunsaturated Fatty Acid (PUFA) because of their beneficial effects on human health, mainly in the prevention of cardiovascular disease (Krauss *et al.*, 2001). However, chicken meat enriched with PUFA contains larger fatty acids with a high number of double bonds, which increases the susceptibility of meat to oxidation (Grau *et al.*, 2001).

Lipid oxidation has been known to cause quality problems by forming off-odour and off-flavour compounds and decreases nutritive value in meat. Lipid oxidation is responsible for the development of unpleasant tastes and odours as well as change in colour, rheological properties and formation of toxic compounds (Malgorzata and Zbigniew, 2007).

The search for natural antioxidant in place of the synthetic type which is capable of causing carcinogenic effect on humans has led to the evaluation of Ethiopian pepper as natural method to retard oxidative process in meat and meat products. Ethiopian pepper's constituents coupled with the fact that it belong to the group of spices suggest it could be a good natural antioxidant. The aim of this study was to investigate the effect of dietary Ethiopian pepper

on oxidative stability of refrigerated raw and cook broiler chicken meat.

MATERIALS AND METHODS

Ninety six-day-old Anak broiler chickens were used in this study. The birds were fed the starter diet for the first four (4) weeks after which the birds were weighed and randomly allotted into four treatments of two replicates with twelve (12) birds per replicate. Ethiopian pepper (*Xylopi aetiopica*) was purchased from Oja Oba in Ilorin, Nigeria. This was milled and then incorporated in the diets. The inclusion levels were 0, 10, 20 and 30g/kg feed.

The birds were fed *ad libitum* during four (4) weeks trial period. Clean water was supplied every day and other routine management practices were observed. The feeding trial was terminated at the end of the 8th week.

Five birds from each treatment (a total of 20) were taken for slaughtering at 8 weeks. The birds after weighing were slaughtered by cutting the jugular vein. The birds were given equal time of bleeding (30 minutes) then scalded in hot water of about 80°C for 30 seconds before they were manually de-feathered. The carcasses were then eviscerated and cut into primal parts (breast, thigh, drumstick, back and wing).

The breast portions of birds were taken, labelled according to their treatment, packed in a wrapper and refrigerated for lipid oxidation assessment of raw meat for a period of 28 days. The drumsticks and thigh were first weighed, and then cooked with the microwave oven for 16 minutes and later cooled to room temperature. The thighs were labelled, and refrigerated for oxidative rancidity assessment. Lipid oxidation in the meat was determined by quantifying Malonaldehyde (MDA) production, based on the Thiobarbituric Acid Reactive Substances (TBARS) test using the aqueous extraction 2 – thiobarbituric acid (TBA) procedure described by Pikul *et al.*, (1989).

Data collected on TBARS analysis of refrigerated, raw and cooked meat samples were subjected to 4 x 4 and 3 x 4 Factorial analyses respectively using Microsoft Excel Statistical Package (V. x P Microsoft Corp. W. A, USA).

RESULTS AND DISCUSSION

Ethiopian pepper inclusion in broiler diet showed no significant difference ($P>0.05$) on meat peroxidation assessment. However, storage day were observed to influence the TBARS values. The highest TBARS value was observed on day 28 of assessment. Interaction between Ethiopian pepper and days of storage was not significant (Table 5.6). This result indicated that dietary Ethiopian pepper exerted no anti-oxidant effect on refrigerated raw broiler meat. This contradicts the result of Dapkevicius (2002) who reported that aromatic and medicinal herbs are rich sources of natural radical scavenging compounds.

Table 3 shows that TBARS value of refrigerated cooked meat of broiler fed different levels of dietary Ethiopian pepper were significantly ($P>0.05$) lower when compared with control. This indicated that addition of Ethiopian pepper at 10g/kg to 30g/kg feed in broiler diet reduced lipid oxidation in cooked broiler meat thus increasing the shelf life of cooked product.

The highest TBARS value was observed on day 4 of the assessment which was significantly higher than day 2. However, interaction between the dietary Ethiopian pepper levels and days of storage was not significant ($P>0.05$). This result was in line with the earlier findings of Lopez-Bote *et al* (1998) who reported that broiler fed

diet containing oats had a lower TBARS value than the control group.

TBARS values were observed to be higher in cooked meat when compared with the raw. This is because with high temperature, myoglobin turns to haematin, which serve as pro-oxidant thereby, accelerates lipid oxidation in cooked meat.

CONCLUSION

The result of this investigation showed that Ethiopian pepper in the diet of broiler chicken exerted no anti-oxidant effects on refrigerated raw broiler meat; however, it proved to be a good natural anti-oxidant on refrigerated cooked broiler meat.

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Table 1: Composition of Experimental Diets

	Ethiopian Pepper inclusion levels (g/kg)			
	0	10	20	30
*Basal diet	100	99.0	98.0	97.0
Ethiopian Pepper	0	1.0	2.0	3.0
Total	100	100	100	100

**Maize 45%, maize offal 5%, wheat offal 5%, Groundnut cake 25%, Soya bean meal 10%, Palm kernel cake 5%, Limestone 1.45%, Bone meal 2.8%, Lysine 0.1%, Methionine 0.1%, salt 0.25%, premix 0.25% and enzyme 0.05%.*

Table 2: Effects of Dietary Ethiopian Pepper on TBARS Value of Refrigerated Raw Broiler Meat

Parameters	TBARS Value	
Ethiopian Pepper Levels (g/kg)		
0	0.84	NS
10	0.82	
20	1.33	
30	1.17	
Storage Time (Days)		
7	1.13 ^{ab}	
14	0.73 ^a	
21	0.93 ^{ab}	
28	1.37 ^b	
+SEM	0.158	
Ethiopian Pepper Levels	P< 0.063	NS
Storage Days	P< 0.038	NS
Interaction	P< 0.783	NS

^{a,b}, Mean values within column carrying different superscripts differ significantly. ($P < 0.05$)

NS: Not significant ($P > 0.05$)

Table 3: Effects of Dietary Ethiopian Pepper on TBARS Value of Refrigerated Cooked Broiler Meat

Parameters	TBARS Value	
Ethiopian Pepper Levels (g/kg)		
0	5.59 ^b	
10	3.95 ^a	
20	3.44 ^a	
30	3.62 ^a	
Storage Time (Days)		
2	3.55 ^a	
4	4.79 ^b	
6	4.11 ^{ab}	
+SEM	0.26	
Ethiopian Pepper Levels	P< 4.13E-05	
Storage Days	P< 0.008	
Interaction	P< 0.252	NS

^{a,b} Mean within column carrying different superscripts differ significantly ($P < 0.05$)

NS: Not significant ($P > 0.05$)