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RESEARCH PAPER

Effects of dietary supplementation of chlorine dioxide (ClO_2) on the composition, fatty acid profile and lipid oxidation in broiler meat

Sonia Tabsum Ahmed[1, 2], Gyoungil Kim[1], Chul-Ju Yang[1*]

[1]Dept. of Animal Science and Technology, Sunchon National University, 255 Jungang-ro, Sunchon, Jeonnam, 540-950, Korea
[2]Dept. of Agribusiness, Atish Dipankar University of Science and Technology, Banani, Dhaka, Bangladesh

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*Corresponding author
E-mail:yangcj@scnu.kr

ABSTRACT

Chlorine dioxide (ClO_2) has been approved for use as antimicrobial agent during poultry processing; however, it's effects on meat characteristics have not yet been investigated. Therefore, in an attempt to understand the interaction of ClO_2 with meat composition, two levels of ClO_2 (0.05 and 0.1%) with control were fed to 96 broiler chicks with basal diets, after which the chemical composition, cholesterol, fatty acid composition, and thiobarbituric acid reactive substance (TBARS) values of broiler meat were investigated. Dietary ClO_2 increased the crude protein and sodium contents of broiler breast and thigh meat, while it significantly reduced cholesterol in breast meat and ether extract in thigh meat ($P<0.05$). Supplementation of 0.1% ClO_2 significantly reduced the proportions of stearic acid and total saturated fatty acid (SFA), while it increased the total monounsaturated fatty acid (MUFA) and the ratio of MUFA/SFA in broiler breast meat ($P<0.05$). In thigh meat, the tetracosaenoic acid and highly unsaturated DGLA and arachidonic acid proportion were lower in the 0.1% ClO_2 supplemented group ($P<0.05$). From day 7 to day 21, the thiobarbituric acid reactive substance values of breast and thigh meat were higher in the 0.1% ClO_2 supplemented group ($P<0.05$) than the control. In conclusion, dietary ClO_2 increased the crude protein and Na contents, while it reduced the cholesterol and SFA contents of broiler meat. However, the increasing TBARS values of broiler breast and thigh meat after 7 days of preservation suggest its use in broiler diets should be restricted.

Key words: Chlorine dioxide; meat composition; fatty acid profile; TBARS; broilers

Introduction

With increasing health awareness among consumers, consumption of poultry meat has increased, in part because of its high content of polyunsaturated fatty acid (PUFA) (Simopoulos 2000). However, microbial growth and oxidative stress causes oxidation of unsaturated fatty acid, thereby reducing the shelf-life of refrigerated meat and meat products (Engberg et al. 1996). Accordingly, preventing microbial growth and retarding lipid oxidation during storage and retail display trade are essential aspects to maintenance of meat quality and safety (Vaithiyanathan et al. 2011).

Chlorine dioxide (ClO_2) has been identified as a broad spectrum antimicrobial agent due to its strong oxidation potential against ribonucleic acids (Alvarez & Brien 1982) or organic compounds found in microbes (Kim et al. 1999). ClO_2 has a bactericidal efficacy seven times higher than the concentration of aqueous chlorine in poultry processing chiller water (Lillard 1979, 1980). Thiessen et al. (1984) reported that ClO_2 is an effective bacteriocide against salmonellae that can increase the shelf-life of broiler carcasses when used in poultry processing chilled water. Furthermore, ClO_2 and its oxidized byproducts have less potential to produce toxic reaction products during treatment of organic matter under a relatively wide range of pH (Tanner, 1989; Junli et al. 1997). However, with the exception of its bactericidal efficacy, little is known about the reaction of ClO_2 with organic matter or its effects on nutrient content, including fatty acid composition.

Oral ingestion of ClO_2 up to a level of 500 ppm (0.05%) was shown to have no toxic effects in chickens and pigs (Demeckova et al. 2002; Lin et al. 2008), and did not affect the palatability of diet and feed intake (Demeckova

et al. 2002). However, to the best of our knowledge, no published studies have investigated the effects of ClO_2 administration with broiler diet. Therefore, this study was conducted to investigate the effects of two levels of dietary ClO_2 powder (0.05 and 0.1%) on meat chemical composition, fatty acid profile, and lipid oxidation of broiler breast and thigh meat.

Materials and methods

Experimental design, birds and diets

All experimental procedures were approved by the Institutional Animal Care and Use Committee of Sunchon National University, Suncheon, Korea. A total of 96 one-day-old Ross 308 male broiler chicks obtained from a commercial hatchery were weighed and randomly allocated to three treatment groups, each of which was replicated four times with eight broilers per replicate. ClO_2 powder (contained 50% ClO_2) was provided by Tecon. Co. Ltd. The treatments were as follows: (1) basal diet without any supplementation (ClO_2 0%); (2) basal diet supplemented with 0.05% ClO_2 and (3) basal diet supplemented with 0.1% ClO_2.

Commercially available broiler diets were used as basal diet prepared with the same batch of ingredients for starter (0 to 21 d) and finisher (22 to 35 d) periods. The ingredients, chemical composition, vitamin and mineral content of the experimental basal diets are shown in Table 1.

Broilers were kept in a closed, ventilated, wire-floor caged broiler house (76 cm long × 60 cm wide × 40 cm high/cage) at a stoking density of 570 cm^2/bird. The cages had a linear feeder in the front and a nipple drinker in the back to provide *ad libitum* feed intake and free access to water throughout the experiment. Temperature was maintained at 33℃ for d 1 to 7, after which it was gradually reduced to 24℃ at a rate of 3℃ per week, where it was maintained until the end of the experiment. The relative humidity was maintained at around 50% and continuous lighting was provided throughout the experimental period. The body weight and feed intake of broilers were recorded every week and the weight gain, feed intake and feed conversion ratio were calculated.

Table 1. Feed ingredients and chemical compositions of the basal diets for broilers.

Item	Starter diet (0 to 3 week)	Finisher diet (4 to 5 week)
Ingredients (g/100g, as feed basis)		
Corn grain	57.58	59.96
Soybean meal	26.59	25.49
Corn gluten	5.00	4.24
Soybean oil	2.20	1.55
Animal fats	4.50	5.00
Common salt	0.25	0.25
Dicalcium phosphate	2.14	2.01
Limestone	0.92	0.88
Vit-Min. premix[#]	0.30	0.30
Choline	0.08	0.07
L-lysine HCl (78%)	0.24	0.16
DL-Methionine	0.20	0.10
Proximate composition		
ME, MJ/kg	13.06	13.23
Moisture, %	12.07	13.08
Crude Ash, %	5.63	5.61
Crude Protein, %	20.89	19.12
Crude fat, %	4.65	2.43
Crude fiber, %	4.42	3.71
Lysine, %	1.44	1.12
Metheionine, %	0.51	0.43
Calcium, %	1.10	0.83
Available phosphorus, %	0.55	0.45

[#]Vitamin-mineral mixture provided the following nutrients per kilogram of diet: vitamin A, 15,000 IU; vitamin D3, 1,500 IU; vitamin E, 20.0 mg; vitamin K3, 0.70 mg; vitamin B12, 0.02 mg; niacin, 22.5 mg; thiamine, 5.0 mg; folic acid, 0.70 mg; pyridoxine, 1.3 mg; riboflavin, 5 mg; pantothenic acid, 25 mg; choline chloride, 175 mg; Mn, 60 mg; Zn, 45 mg; I, 1.25 mg; Se, 0.4 mg; Cu, 10.0 mg; Fe, 72 mg; Co, 2.5 mg (Bayer Korea Ltd., Dongjak-Ku, Seoul, Korea).

Measurements and analyses

Meat yield and internal organ development assay

At the end of the feeding trial, three birds per replication were selected at random and slaughtered. Live weight and dressed weight were recorded to calculate the dressing percentage. The breast and thigh meat were separated from the bone and the percentages of breast and thigh meat were calculated using the following formula:

Breast and thigh leg percentage = (breast or leg absolute weight × 100) / live body weight.

The internal organs were separated from the carcass and the organ relative weights (%) were determined by calculating the weights of individual organs with respect to live body weight.

Analysis of meat proximate composition, cholesterol and trace mineral

To investigate the meat composition, breast and thigh meat were excised and grinded separately with a meat grinder. The samples were then analyzed in triplicate for moisture (930.15), total ash (942.05), crude protein (990.03), and crude fat (991.36) contents, as described by AOAC International (2000).

Cholesterol was separated from fat after saponification with KOH and extraction with ethyl ether by the method described by King et al. (1998). The amount of cholesterol was analyzed using a gas chromatograph (DS 6200, Donam Co., Seongnam, Gyeonggi-do, Korea) equipped with a flame ionization detector and a Hewlett Packard HP-5 capillary column (J&W Scientific, USA) 30 m in length with a 0.32 mm internal diameter and 0.25 μm polyethylene glycol-film thickness. The chromatographic conditions were as follows: carrier gas, nitrogen; initial oven temperature, 250℃ (held for 2 min), followed by an increase of 15℃/min to 290℃ (held for 10 min), then 10℃/min to a final temperature of 310℃ (held for 10 min); injector and detector temperatures, 280℃; split ratio, 50:1; sample volume injected, 2μL. Cholesterol content was expressed as mg/100g meat.

Trace mineral contents were determined using an Atomic Absorption Spectrophotometer (AA-6200, Korea) according to the method described by Mun et al. (2014).

Meat fatty acid composition assay

A direct method for fatty acid methyl ester (FAME) synthesis described by O'Fallon *et al*. (2007) was used to analyze the fatty acid profile of broiler breast and thigh meat. The fatty acid composition of the FAME was determined using a Gas Chromatograph (Agilent, 7890A series, USA) equipped with a flame ionization detector and a Hewlett Packard HP-88 capillary column (J&W Scientific, USA) (60 m ×0.52 mm × 0.20 μm). Samples were injected using an auto-sampler (Agilent Technologies 7693, USA), after which they were subjected to the following chromatographic conditions: initial oven temperature, 125℃ (held for 1 min), followed by an increase to 145℃ at a rate of 10℃/min (held for 26 min), then a further increase to 220℃ at a rate of 2℃/min (held for 2 min); carrier gas, purified air, and H_2; makeup gas, helium; injector and detector temperature, 260℃; split ratio, 30:1. Fatty acids were identified by comparing their retention times with those of their relative standards.

Oxidative rancidity analysis

The oxidative stability of 1, 3, 5, 7, 14, 21, and 28 day old meat broiler breast and thigh meats (stored at 4℃) was determined using the method described by Hossain et al. (2012). The absorbance was measured at 530 nm with a VIS-Spectrophotometer (Libra S22, Biochrom Ltd. Cambridge, England) and the TBARS value was expressed as micromoles of malondialdihyde (MDA) per 100 g of meat.

Statistical analyses

The experiment was carried out as a completely randomized design with three treatments. Data were subjected to ANOVA using the PROC GML function of the Statistical Analysis System (SAS 2003). Pens were used as the experimental unit for growth performance parameters (BW, ADG, ADFI and FCR), whereas groups of three birds served as the experimental unit for meat yield, meat composition, and oxidative stability of meat. Significant differences among treatment means were identified by a Student's *t* test and a probability level of $p \leq 0.05$ was considered statistically significant.

Results and discussion

Dietary supplementation with 0.1% ClO_2 significantly reduced the feed intake of broilers during the overall period (98.56 vs 91.89 g/bird/day) without affecting the weight gain and feed conversion ratio of broilers. In contrast to our results, Demeckova et al. (2002) reported no negative effects of ClO_2 on the feed intake. Table 2 shows the effects of dietary ClO_2 on the meat yield and relative organ weight of broilers. The dressing percentage, relative weight of breast and thigh, and relative weight of internal organs did not differ ($p > 0.05$) among treatment groups, except for the crop weight, which was significantly lower in both ClO_2 supplemented groups ($p < 0.02$). The reduced crop weight may be a reflection of lower feed intake due to the inclusion of ClO_2 in broiler diets.

The effects of oral administration of ClO_2 on the meat composition of laboratory animals have not yet been investigated. As shown in Table 3, dietary supplementation with 0.1% ClO_2 significantly increased the crude protein content ($p < 0.02$) of broiler breast meat without affecting the moisture, crude ash and ether extract contents. The cholesterol content of breast meat was significantly lower ($p < 0.0001$) in both ClO_2 supplemented groups. In thigh meat, dietary ClO_2 significantly increased the moisture and crude protein contents ($p < 0.05$), whereas it reduced the ether extract contents ($p = 0.002$). Among trace minerals, Na content of breast and thigh meat was higher ($p < 0.05$) in response to dietary supplementation of ClO_2 relative to the control. An *in vivo* recovery study by Bercz et al. (1982) suggested that ingested chlorine dioxide is rapidly reduced in the stomach to non-oxidizing species,

predominantly chloride, which is necessary for the production of hydrochloric acid in the stomach of monogastric animals and required for the digestion and subsequent absorption of nutrients from feed (Spears 2011).Hydrochloric acid activates pepsin, the enzyme that initiates protein digestion in the stomach, and modifies the structure of proteins so they become more susceptible to enzymatic digestion in the small intestine (Spears 2011). The higher protein content in breast and thigh meat of broilers may be due to enhanced digestion and absorption of dietary protein in response to dietary ClO_2 supplementation. Revis et al. (1986) reported higher levels of plasma cholesterol in pigeons treated with ClO_2 in drinking water, which contradicts the results of the present study. The reason for this discrepancy is not known; however, formation of chlorinated products [chlorite (ClO2-), chlorate (ClO3-) and chloride (Cl-)] in the upper gastrointestinal tract was likely a factor in the observed change in meat cholesterol. Presence of chloride may also increase the absorption of Na in the intestinal tract, resulting in higher Na in broiler meat.

Table 2. Effects of dietary chlorine dioxide (ClO_2) on the meat yield and relative organ weight of broilers.

	ClO_2				
Parameters (%)	0%	0.05%	0.1%	SEM	*p*-value
Dressed yield	64.50	65.65	64.29	0.84	ns
Relative breast weight	30.93	22.36	22.69	1.06	ns
Relative thigh weight	13.68	14.87	14.86	1.30	ns
Relative organ weight					
Crop	0.41[a]	0.30[b]	0.33[b]	0.02	*
Proventiculus	0.46	0.42	0.48	0.05	ns
Heart	0.46	0.42	0.43	0.02	ns
Liver	2.01	2.08	2.15	0.21	ns
Spleen	0.07	0.07	0.08	0.01	ns
Gizzard	1.19	1.13	0.95	0.10	ns
Pancreas	0.18	0.16	0.17	0.02	ns
Kidney	0.54	0.49	0.57	0.04	ns
Small intestine	2.83	2.49	3.03	0.16	ns
Large intestine	0.15	0.21	0.16	0.02	ns
Cecum	0.53	0.60	0.57	0.07	ns
Abdominal fat	1.75	1.72	1.62	0.09	ns
Bursa	0.09	0.08	0.10	0.02	ns

Each value represents the means of 4 replications with 3 birds/replication.
[a,b]Different letters in the same row donate significant ($p < 0.05$) differences among treatments. *$p < 0.05$; ns, not significant.

Of the various components that affect quality attributes of meat, lipids are most important. Hydrolysis and oxidation of lipids during processing and storage have negative effects on flavor, color and texture of meat. The effects of dietary ClO_2 on the fatty acid composition of broiler breast and thigh meat are shown in Tables 4 and 5. In breast meat (Table 4), the proportions of stearic acid ($p < 0.01$) and total SFA ($p < 0.02$) were lower in the 0.1% ClO_2 supplemented group. The individual monounsaturated fatty acid did not differ among treatment groups, whereas the sum of MUFAs was higher in the 0.1% ClO_2 supplemented group ($p < 0.03$) than the control. This can be explained by the conversion of stearic acid to oleic acid in broiler meat (Bruce & Salter 1996). The lower concentration of SFA and higher concentration of MUFA increased the ratio of MUFA/SFA in the 0.1% ClO_2 supplemented group. Dietary supplementation with ClO_2 had no effect on the proportion of polyunsaturated fatty acids in broiler breast meat, expect for DGLA, which was significantly lower in the 0.1% ClO_2 supplemented group ($p < 0.0001$) than the control. The proportion of n-3 fatty acid tended to be higher in both of the ClO_2supplemented groups ($p < 0.08$), with a subsequent decrease in the ratio of n-6/n-3 ($p < 0.06$).

In thigh meat (Table 5), the proportion of palmitic acid and sum of SFAs tended to be lower in the 0.05% ClO_2 supplemented group ($p < 0.10$). Monounsaturated tetracosaenoic acid content was lower in the 0.1% ClO_2 supplemented group ($p = 0.001$). The proportion of highly unsaturated fatty acids DGLA and arachidonic acid was also lower in the 0.1% ClO_2 supplemented group ($p < 0.001$) than the non-supplemented group. There were no noticeable differences in the sum of MUFA, PUFA, n-3 and n-6 fatty acid proportion and their ratios of thigh meat that appeared to be a result of ClO_2 supplementation. Chlorine dioxide is a potent oxidizer; therefore, the double bonds of fatty acid moieties can undergo oxidation in its presence (Kim et al. 1997; EFSA 2005). The lower concentration of DGLA and arachidonic acid in broiler meat may have been due to lipid oxidation in the presence of ClO_2 (Moran et al. 1953; Meredith et al. 1956; Kim et al. 1997). In contrast to our results, Kim et al. (1997) reported no significant effects of ClO_2 treatments on the fatty acid composition of salmon and red grouper fillets.

Table 3. Effects of dietary chlorine dioxide (ClO_2) on the proximate composition, cholesterol and trace mineral contents of broiler meat.

Parameters	ClO_2			SEM	P-value
	0%	0.05%	0.1%		
Breast meat					
Moisture (%)	72.82	72.79	72.11	0.37	ns
Crude ash (%)	1.39	1.45	1.36	0.05	ns
Crude Protein (%)	25.71[b]	26.69[ab]	27.74[a]	0.38	*
Ether extract (%)	1.33	1.36	1.29	0.08	ns
Cholesterol (mg/100g)	77.27[a]	27.43[c]	53.69[b]	3.30	**
Calcium (mg/100g)	3.20	3.43	3.27	0.18	ns
Iron (mg/100g)	1.383	2.36	2.47	0.24	ns
Magnesium (mg/100g)	22.60	23.25	22.10	1.71	ns
Sodium (mg/100g)	30.67[b]	51.88[a]	43.26[a]	2.74	**
Thigh Meat					
Moisture (%)	65.59[b]	69.78[a]	69.68[a]	0.99	*
Crude ash (%)	1.14	1.19	1.25	0.08	ns
Crude Protein (%)	21.67[b]	23.54[a]	24.15[a]	0.49	*
Ether extract (%)	4.33[a]	2.84[b]	2.92[b]	0.21	**
Cholesterol (mg/100g)	63.07	73.29	67.83	7.72	ns
Calcium (mg/100g)	3.45	3.40	3.40	0.25	ns
Iron (mg/100g)	17.59	18.01	16.63	1.11	ns
Magnesium (mg/100g)	23.14	22.80	22.25	0.99	ns
Sodium (mg/100g)	53.62[b]	51.82[b]	73.94[a]	1.49	**

Each value represents the means of 4 replications with 3 birds/replication.
[a,b]Different letters in the same row donate significant (P<0.05) differences among treatments. *P<0.05; **P<0.01; ns, not significant.

Table 4. Effects of dietary chlorine dioxide (ClO_2) on the fatty acid composition of broiler breast meat.

Fatty acid (% of total)	ClO_2			SEM	P-value
	0%	0.05%	0.1%		
Myristic acid (C14:0)	0.89	0.86	0.78	0.06	ns
Palmitic acid (C16:0)	23.15	22.65	22.98	0.56	ns
Palmitoleic acid (C16:1n7)	4.09	3.99	4.61	0.26	ns
Stearic acid (C18:0)	10.33[a]	9.62[a]	7.84[b]	0.39	**
Oleic acid (C18:1n9)	36.92	38.15	39.94	0.83	ns
Linoleic acid (C18:2n6)	16.16	15.65	15.82	0.46	ns
α-linolenic acid (C18:3n3)	1.58	1.60	1.63	0.06	ns
DGLA (C20:3n6)	1.26[a]	1.26[a]	0.70[b]	0.05	**
Arachidonic acid (C20:4n6)	3.01	3.16	2.82	0.24	ns
Eicosapentanoic acid (C20:5n3)	0.15	0.21	0.17	0.02	ns
Docosahexaenoic acid (C22:6n3)	1.18	1.63	1.47	0.16	ns
Tetracosaenoic acid (C24:1n9)	1.30	1.24	1.25	0.11	ns
∑SFA	34.36[a]	33.13[ab]	30.35[b]	0.47	*
∑MUFA	42.19[b]	43.77[ab]	46.02[a]	0.83	*
∑PUFA	22.16	21.87	21.14	0.46	ns
∑n-3	2.92	3.43	3.26	0.14	ns
∑n-6	20.42	20.06	19.34	0.49	ns
MUFA/SFA	1.23[b]	1.32[ab]	1.46[a]	0.04	*
PUFA/SFA	0.65	0.66	0.67	0.01	ns
n-6/n-3	7.06	5.87	5.96	0.31	ns

Each value represents the means of 4 replications with 3 birds/replication.
∑SFA, sum of saturated fatty acid;∑MUFA,sum of mono-unsaturated fatty acid; ∑PUFA, sum of poly-unsaturated fatty acid; ∑n-3,sum of omega 3 fatty acid; ∑n-6,sum of omega 6 fatty acid.
[a,b]Different letters in the same row donate significant (P<0.05) differences among treatments. *P<0.05; **P<0.01; ns, not significant.

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Table 5. Effects of dietary chlorine dioxide (ClO_2) on the fatty acid composition of broiler thigh meat.

Fatty acids (% of total)	ClO_2			SEM	P value
	0%	0.05%	0.1%		
Myristic acid (C14:0)	0.98	0.94	0.96	0.02	ns
Myristoleic acid (C14:1 n5)	0.34	0.31	0.31	0.02	ns
Palmitic acid (C16:0)	23.32	21.37	23.75	0.68	ns
Palmitoleic acid (C16:1n7)	6.27	6.19	6.32	0.11	ns
Stearic acid (C18:0)	6.18	5.90	5.75	0.13	ns
Oleic acid (C18:1n9)	41.05	43.59	42.42	0.84	ns
Linoleic acid(C18:2n6)	16.66	16.47	15.83	0.47	ns
α-linolenic acid (C18:3n3)	0.20	1.21	1.15	0.05	ns
Arachidic acid (C20:0)	0.97	0.92	0.92	0.03	ns
Eicosenoic acid (C20:1n9)	0.10	0.11	0.11	0.01	ns
Eicosadienoic acid (C20:2n6)	0.15	0.15	0.13	0.01	ns
DGLA (C20:3n6)	0.20^{a}	0.21^{a}	0.15^{b}	0.01	**
Arachidonic acid (C20:4n6)	0.92^{a}	0.91^{a}	0.61^{b}	0.03	**
Eicosapentanoic acid (C20:5n3)	0.23	0.27	0.27	0.01	ns
Docosahexaenoic acid (C22:6n3)	1.18	1.22	1.18	0.04	ns
Tetracosaenoic acid (C24:1n9)	0.26^{a}	0.25^{a}	0.17^{b}	0.01	**
∑SFA	31.45	29.14	31.37	0.71	ns
∑MUFA	48.01	50.44	49.33	0.82	ns
∑PUFA	20.54	20.43	19.30	0.45	ns
∑n-3	2.61	2.70	2.60	0.07	ns
∑n-6	17.93	17.73	16.71	0.45	ns
MUFA/SFA	1.54	1.73	1.58	0.06	ns
PUFA/SFA	0.66^{ab}	0.70^{a}	0.62^{b}	0.02	*
n-6/n-3	6.88	6.58	6.47	0.23	ns

Each value represents the means of 5 replications with 4 birds/replication.
∑SFA, sum of saturated fatty acid;∑MUFA, sum of mono-unsaturated fatty acid; ∑PUFA, sum of poly-unsaturated fatty acid; ∑n-3,sum of omega 3 fatty acid; ∑n-6,sum of omega 6 fatty acid.
[a,b]Different letters in the same row donate significant (P<0.05) differences among treatments. *P<0.05; **P<0.01; ns, not significant.

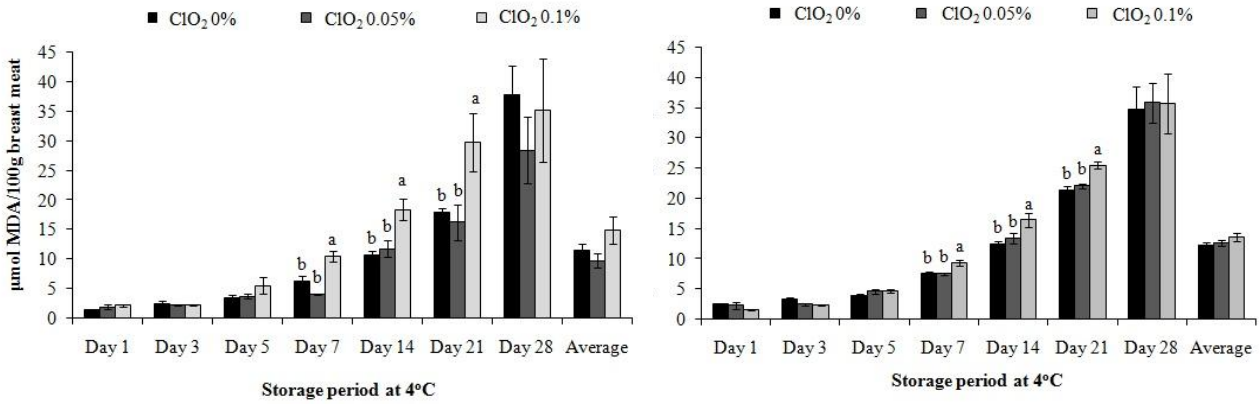

Figure 1. Effects of dietary chlorine dioxide (ClO_2) on thiobarbituric acid reactive substances (TBARS) values of broiler breast and thigh meat. Bars within a particular storage period not sharing common superscript differ significantly ($p < 0.05$).

The effects of dietary ClO_2 on the TBARS values of breast and thigh meat after different storage periods are shown in Figure 1. No differences were observed in TBARS values of breast and thigh meat among treatments for up to 5 days of storage at refrigerating temperature ($p > 0.05$). From day 7 to day 21, the TBARS values were higher in the breast and thigh meat of broilers fed diets supplemented with 0.1% ClO_2 ($p < 0.05$). Dietary supplementation with ClO_2 caused a dose-related increase in the TBARS values of breast and thigh meat. Kim et al. (1997) also reported a dose-dependent increase in the TBARS value of salmon and red grouper fillets after ClO_2 treatment. Oxidation of fatty acids in the presence of ClO_2 may have been responsible for the higher TBARS value (Moran et al. 1953; Meredith et al. 1956).

Conclusions

The results of the present study showed that inclusion of ClO_2 in diets reduced the feed intake of broilers without affecting the weight gain, feed efficiency and meat yield. Dietary ClO_2 increased the crude protein content of broiler

breast and thigh meat, while reduced the cholesterol in breast meat and ether extract in thigh meat. Supplementation of 0.1% ClO_2 in broiler diets reduced the SFAs contents in broiler breast meat while increased the proportion of MUFAs. However, the concentration of highly unsaturated fatty acids, DGLA (in breast and thigh meat) and arachidonic acid (in thigh meat) was reduced in response to dietary 0.1% ClO_2. The oxidative rancidity value (TBARS) of broiler breast and thigh meat was also higher in the 0.1% ClO_2 supplemented group. In conclusion, this study found no significant effect of dietary ClO_2 for broiler meat quality improvement and suggested its restricted use in broiler diets.

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