# TOTAL ANTIOXIDANT CAPACITY OF CHICKEN MEAT FROM ORGANIC MINERAL SUPLEMENTATION

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**Abstract – Dietary antioxidant supplements enhance the quality of meat through modification of tissue metabolic processes. This study investigated the influence of dietary antioxidants on the oxidative properties of chicken broiler breast meat stored in air-permeable polyvinylchloride during retail display at 4°C for up to 7 d. Broilers were fed organic mineral antioxidant pack for 42 d. Lipid and protein oxidation were analyzed. Lipid oxidation (TBA reactive substances) and protein oxidation (Protein sulfhydryls) were significantly protected by antioxidant diets. The results demonstrate that dietary antioxidants (Zn and Se) can minimize the oxidative instability of proteins and lipids.**

**Key Words –broiler, antioxidant-supplemented diet, meat quality**

## I. INTRODUCTION

Poultry meat contains a high proportion of PUFA, which is more susceptible to oxidative processes than pork or beef. The oxidative reactions postmortem in muscle foods causes quality deterioration during processing and storage. Therefore, incorporation of dietary antioxidants, such as Se in poultry feed, has been implemented to achieve optimal meat quality. The present study was designed to assess the influence of a natural algae-based Se yeast and organic mineral antioxidant on the oxidative properties of chicken broiler breast meat. Chicken meat was packaged and stored in air-permeable polyvinylchloride (PVC) packaging systems during retail display at 4°C for up to 7 d.

## II. MATERIALS AND METHODS

2.1. Broiler production. Three independent feeding trials (n = 3) over a 2-yr period were performed. In each, 990 male broilers were raised from 1 to 42 d of age and randomly placed in 48 floor pens with 20 birds per pen. Each pen was randomly designated with two different dietary treatments consisting of feeding (C) basal diet (A) basal diet with supplemented organic minerals (Zinc and Selenium).
2.2. Meat Preparation. After 42 d of feeding, one broiler from each of the 48 pens (4 diets × 12 pens) was randomly selected, humanely harvested and then chilled. Both sides of the breast (pectoralis major) were then removed and skinned. Eight broilers per dietary treatment (total of 32 per trial) were humanely harvested, and the pectoralis major muscle tissue was removed and stored at –20°C until use. Selenium and Zn content was measured according to Olson et al. [1] and Montaser and Golightly [2], respectively.
2.3. Lipid and Protein oxidation. Lipid oxidation in stored muscle samples was measured as TBA reactive substances (TBARS) according to Sinnhuber and Yu [3]. Sulfhydryls were determined using 5,5´ dithio-bis(2-nitrobenzoic acid; Ellman, [4]). Total sulfhydryl content was calculated using the molar extinction coefficient of 13,600 M/cm and expressed as nanomoles per milligram of protein.
2.4. Statistical analysiys. Data were subjected to ANOVA using the Statistix software 8.0 (Analytical Software, Tallahassee, FL) with the GLM procedure to determine the significance of main treatment factors (diet with minreal). Least significant difference all-pairwise multiple comparisons were performed to separate the means when a treatment effect was found to be significant ($P < 0.05$).

## III. RESULTS AND DISCUSSION

3.1.Tissue Antioxidative minerals. Diets with antioxidant supplementation (A) significantly ($P < 0.05$) increased tissue Se and zinc content compared with the basal diet (C).
3.2. Lipid oxidation. For all dietary treatments, lipid oxidation increased throughout the first 7 d of storage under each packaging condition. Samples from birds fed an antioxidant-supplemented diet, regardless of oil quality, showed lower TBARS formation compared with basal dietary regimens. The lower levels of TBARS formation in the antioxidant-

supplemented diets may be attributed to the supplementation con selenium. Se is an essential trace mineral that serves as a key component (co-factor) in various selenoproteins and selenoenzymes [5].

3.2. Protein oxidation. Significant ($P < 0.05$) losses of sulfhydryls occurred from d 0 to 7 in for all dietary treatments, whereas A samples remained relatively constant. Protein oxidation (Protein sulfhydryls) was inhibited by up to 32.5% ($P < 0.05$) with an antioxidant-supplemented diet when compared with diets without antioxidants. Therefore, protein sulfhydryls were significantly protected by antioxidant diets. Selenium, an antioxidant mineral, act as cofactor for glutathione peroxidase enzyme that catalyzes the reduction of lipid peroxides), thereby preventing oxidative damage. Previous studies [6, 7] reported beneficial effects of organic minerals on meat quality that may be attributed to its greater bioavailability and absorption compared with inorganic minerals.

Table 1 Effect of diet on lipid oxidation (TBARS) and protein oxidation (free sulphydryl nmol/mg of protein) in broiler meat packaged in air-permeable polyvinylchloride during refrigerate storage at 4ºC.

| | Days | TBARS (mgMDA/Kg meat) | Free sulfhydryl (nmol/mg of protein) |
|---|---|---|---|
| CONTROL (C) | 0 | 0.03 ± 0.02 | 68.2 ± 0.15 |
| | 1 | $0.17 \pm 0.05^{a}$ | $60.7 \pm 0.13^{b}$ |
| | 3 | $0.25 \pm 0.05^{a}$ | $56.4 \pm 0.15^{b}$ |
| | 7 | $0.54 \pm 002^{a}$ | $40.8 \pm 0.18^{b}$ |
| ANTIOXIDANTS (A) | 0 | 0.02 ± 0.01 | 70.3 ± 0.05 |
| | 1 | $0.09 \pm 0.02^{b}$ | $65.3 \pm 0.14^{a}$ |
| | 3 | $0.17 \pm 0.07^{b}$ | $62.3 \pm 0.11^{a}$ |
| | 7 | $0.36 \pm 0.05^{b}$ | $59.3 \pm 0.13^{a}$ |

Means ($n = 3$) without a common letter differ significantly ($P < 0.05$).

## IV. CONCLUSION

The results indicate that dietary supplementation with organic mineral antioxidants (Zinc and Selenium) imparted a protective barrier against lipid and protein oxidation of broiler breast meat under air-permeable polyvinylchloride packaging throughout retail display.

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