EFFECT OF GINGER POWDER-BASED DIET AS NATURAL TENDERIZER OF MEAT FROM SPENT LAYER HENS

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ABSTRACT

This study evaluated the effect of ginger powder- based diet as a natural tenderizer of spent layer hens' meat. Seventy-two spent layer hens were assigned to four (4) dietary treatment groups with six (6) birds per replicate and three (3) replicates per treatment in a completely randomized design. Dried ginger was milled and added as additive to the basal diet of the birds at 5%, 10% and 15% inclusion levels. After two weeks of feeding trial, the birds were slaughtered and the meat subjected to shear force, extract release volume (ERV) and water holding capacity (WHC) measurements using standard procedures. Data were analyzed using descriptive statistics and ANOVA at $\alpha_{0.05.}$ Based on the result obtained, as the ginger inclusion level increased, the meat tenderness increased. Control was significantly higher in shear force value with least value in meat from birds fed 15% ginger-based diet. Both ERV and WHC values increased as inclusion level of ginger increased. In conclusion, up to 15% ginger powder can be included in diet of spent layer hens to achieve meat tenderness two weeks prior to slaughter.

Keywords: ginger powder, spent layer, tenderization, water holding capacity and shear force

INTRODUCTION

Tenderness is considered to be the most important organoleptic characteristics of meat (Lawrie, 1991). Meat tenderisation could decrease the toughness of meat from spent layer hens as they are known to possess tough meat as a result of the work done during the months of laying. Many enzymes are being used commercially for meat tenderisation through their effect on the structural integrity of collagen, which can be unaffected during post mortem aging of meat (Bailey *et al.*, 1985). Changes in collagen's physicochemical (Stanton and Light, 1990), mechanical (Nishimura *et al.*, 1998) and ultra-structural (Liu *et al.*, 1995) properties have been observed.

A promising protease "Zingibain" isolated from *Zingiber officinale* roscoe (Ginger rhizome) has been reported to have proteolytic activity. Its proteolytic activity on collagen was found to act on actomyosin, and the combined proteolytic of these two muscle proteins improved the tenderness of meat. Besides tenderizing properties, antioxidant and anti-microbial characteristics of ginger extract have been reported by different workers (Mendiratta *et al*,.2000). However, ginger rhizome is used primarily as a flavouring agent for bakery products and as a sausage seasoning. Its utilisation as a meat tenderizing agent is not fully appreciated and the literature available is limited. Therefore, the aim of this study was to evaluate the meat tenderising effect of ginger powder included in diets for spent layer hens.

MATERIALS AND METHODS

Experiment site: The research was carried out in the Poultry Section of Livestock Investigation Department (LID), of National Veterinary Research Institute, Jos South Local Government Area, Plateau State on Latitude 09°44°N and Longitude 08°45°E, with physical features of rocky granites of old volcanoes.

Seventy-two spent layer hens were assigned to four (4) dietary treatment groups with six (6) birds per replicate and three (3) replicate per treatment in a completely randomized design.

Experimental Materials

Dried ginger was purchased at a local market (Bukuru market). The dried ginger was milled and added as additive to the basal diet of the layers in 0%, 5%, 10% and 15% inclusion levels.. The processing (drying and milling) of the materials was monitored. The feeding trial was carried out for (2) two weeks. The birds were fed once a day, feed intake and left over feed was measured daily. Routine management practices were also carried out.

Parameters measured

Shear force determination: The objective evaluation of tenderness was performed using the modified Warner Bratzler shear force procedure (Bouton and Harris, 1978).

Water holding capacity determination: Water Holding Capacity (WHC) was determined according to Wardlaw *et al.* (1973).

Determination of Extract Release Volume (ERV): This was done according to Jay (1964).

Experimental design

The experimental design was a completely randomised design.

Statistical Analysis

The data was statistically analyzed with the SPSS program for Windows (SPSS version 21.0, SPSS Inc., Chicago, IL, USA). Duncan's multiple-range test was used to compare the difference between means.

RESULTS AND DISCUSSION

The shear force of meat from spent layer hens fed ginger-based diet is showed in Figure 1. A consistent pattern was observed in the shear force of the meat obtained. As the inclusion levels of ginger increased, there was decrease in the shear force values. The shear force values of meat indicate tenderness of meat. High shear force values indicates an increased toughness of meat. . However, when the values obtained are low, it shows that the meat is tender. The results obtained could be attributed to the effect of proteolytic enzyme found in the ginger which may have led to more degradation and availability of dietary protein. Naveena and Mendiratta (2001) also observed that in ginger powder treated samples the shear force values were low when compared with the control. Khanna and Panda (2007) also reported a reduction in shear force values of papain-treated spent hen meat. The shear force value of ginger and papain treated samples were almost closer to that of broiler meat

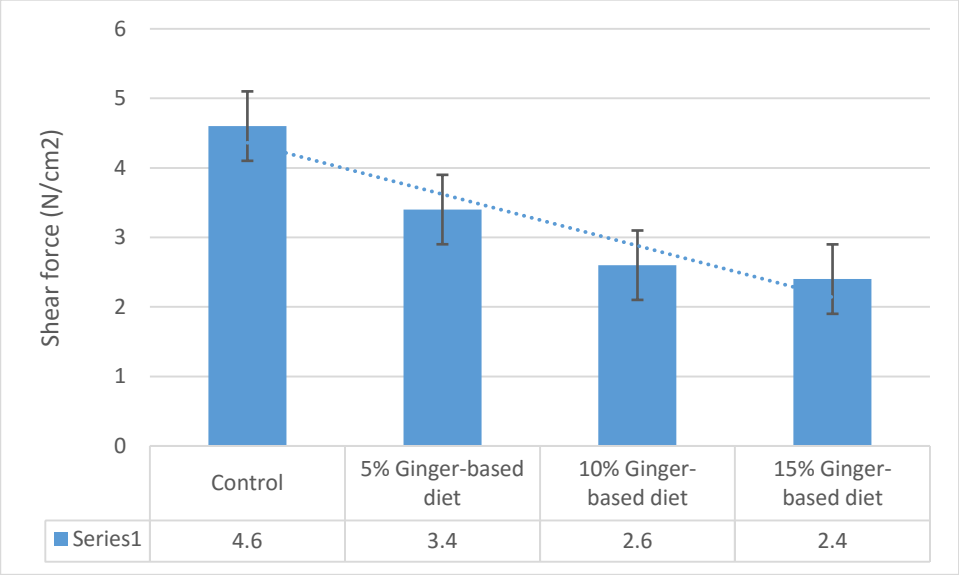

Figure 1: Effect of ginger based diet on shear force value of meat from spent layer hens

Figure 2 shows the water holding capacity and extract release volume of meat from spent layer hens fed ginger-based diet. The water holding capacity (WHC) is the ability of meat to hold on to its water after external pressure was applied. A trend was observed; there was an increase in WHC as the inclusion levels increased. LowerWHC values ranging from 38.70 to 47.00 (%) was reported by Muthulakshmi *et al.* (2018) while higher WHC values than control was in agreement with reports by Naveena and Mendiratta (2001). Khanna and Panda (2007) reported increased WHC of spent hen meat treated with papain and Naveena *et al.* (2004) reported similar results in buffalo meat treated with ginger extract.

Extract release volume (ERV) is a measurement technique that is based on the volume of aqueous extract released by homogenate of meat when allowed to pass through the filter paper for a given period of time By this, meat of good organoleptic and microbial quality release large volume of extract, whereas meat of poor quality releases smaller volume or none. A trend was observed in the result obtained in this study. As the inclusion level increased, the ERV increased. The result obtained shows that as the inclusion level increased the meat organoleptic and microbial quality was improved. This could be due to reported phytochemical substances present in the ginger powder (Mendiratta *et al,*.2000)

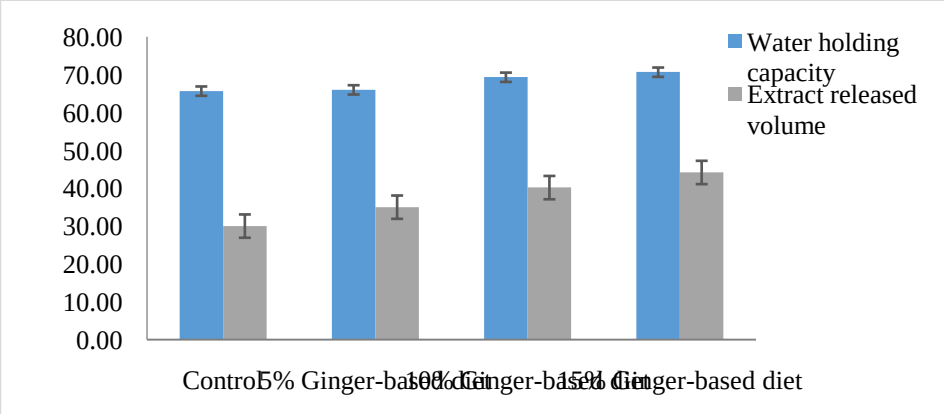

Figure 2: Effect of ginger-based diets on water holding capacity and extract release volume of meat from spen layer hens

CONCLUSION

Addition of 10 to 15% ginger powder into basal diet of spent layer hens is an effective meat tenderizer and the tenderization is achieved through its action on both myofibrillar and connective tissue components of the meat.

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