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# Effect of Dietary Cinnamon Powder on the Organoleptic Properties of Cockerel Chickens

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**ABSTRACT**

**Background:** The experiment was conducted to compare the meat quality characteristics of cockerel chickens fed different inclusion levels of cinnamon powder.

**Methods:** A total of 150 1-day old ISA Brown strain were used for the experiment and was randomly distributed to five treatments of 30 birds each with three replicate of 10 birds per replica. The dietary treatment consisted of $T_1$, $T_2$, $T_3$, $T_4$, and $T_5$ with 0.0g, 0.5g, 1.0g, 1.5g, and 2.0g supplementation of cinnamon powder in 4 litres of water. The experiment lasted for 16 weeks. At the end of the 16$^{th}$ week, the birds were starved of feed overnight, slaughtered, de-feathered, and eviscerated. The chickens were properly labelled according to treatment/replicate and were cooked separately without any spice. The chickens were fed to professional board of tasters, and the colour, flavour, tenderness, juiciness, and overall acceptability were determined.

**Results**: The result revealed that cinnamon supplementation affected the colour, flavour, tenderness, juiciness, and overall acceptability significantly ($p<0.05$).

**Conclusions**: It can be concluded that chickens fed 2.0g of cinnamon powder in water had an improved flavor, juiciness, tenderness, and acceptability compared with the control and other dietary treatments.

## INTRODUCTION

Poultry provides nutritionally beneficial food containing high-quality protein accompanied by a low proportion of fat. Agriculturist and nutritionists have generally agreed that developing the poultry industry of Nigeria is the fastest means of bridging the protein-deficiency gap presently prevailing in the country. Poultry production has an important economic, social, and cultural benefit and plays a significant role in family nutrition in developing countries (Delgado et al., 1999). It has been estimated that 80% of the poultry population in Africa is found in traditional scavenging systems (Gueye, 2000). In most tropical countries it is based mainly on scavenging production systems, which makes substantial contributions to household food security

throughout the developing world (Muchadeyi *et al*., 2007). Indigenous breeds still contribute meaningfully to poultry meat and egg production and consumption in developing countries, where they make up to 90% of the total poultry population. A Central Statistics Agency CSA (2015) report revealed that 95.86% of the total poultry population comprises indigenous birds, while 2.79 hybrids and 1.35% are exotic breeds.

Cockerels coming from the word cock is known as a young cock not having an age older than one year. Cocks are also known as fighters without mercy for centuries. They can mate with 5-6 hens at a time and one cock or cockerel can stay with a family of five to six female birds. Cocks cannot accept another cock in their family, so they fight until one survives and take possession of the family. So these skills of fighting start developing in the early stages of the cockerels. Cockerels also like to be in higher positions from the soil, and thus they are seen on high trees (Danae, 1990).

Cockerels the egg-type male chicks production is an essential component of family poultry development with the increasing trends of commercial layers farming. The layers farmers usually buy female chicks from the hatchery and a significant number of male chicks remain in the hatchery and are sold at a low price or destroyed since there is little or no facility to market these chicks. Cockerels can be grown as a source of meat as most customers prefer cockerel as a source of poultry meat because of its hardiness. (Huque *et al*., 2004).

Cockerels from strain of laying hens take a long period to grow. Despite this, cockerels are present in high numbers in developing countries where the accessibility and price of day-old chicks are frequently constraints. The efficient supply of the animal category is very low in research activities. On the other hand, poultry feed represents 60-80% of the cost of inputs in commercial poultry production. (Branckaert *et al.,* 2000).

Aromatic plants have been used worldwide for centuries as food and for medicinal purposes. Various biological activities, such as antioxidative (Botsoglou *et al.,* 2002; Giannenas *et al.,* 2005; Florou-Paneri *et al.,* 2006), anticoccidial (Christaki *et al.,* 2004; Florou-Paneri et al., 2006) or antimicrobial (Govaris *et al.,* 2007; Botsoglou *et al.,* 2010) properties have been identified in these plants. Consequently, an increasing interest in the use of these products in poultry nutrition has been experienced especially since the complete ban by the European Union countries in 2006 (EU, 2005) on the use of antibiotics as growth promoters in animals. Cinnamon (*Cinnamomum verum)* is an herb commonly used as a spice in human food and has received considerable attention as an additive in poultry nutrition. Cinnamon is obtained from several trees from the genus Cinnamomum that is used in both sweet and savory human foods. In addition to giving flavor to foods, cinnamaldehyde which is the predominant compound of cinnamon, and it presents antimicrobial and antioxidant activity (Lee *et al*., 2004; Faix *et al.,* 2009). According to Al-Kassie (2009), the use of cinnamon extract improves feed efficiency and performance of broilers due to substances such as cinnamaldehyde and eugenol. Cinnamon extract inhibits *Helicobacterpylori* at the concentration range of common antibiotics, its antimicrobial properties are mainly related to its cinnamaldehyde content, followed by eugenol and carvacrol contents (Tabak *et al*., 1999).

Feed additives are an ideal tool to boost the profits of poultry farmers. Natural medicinal products originating from herbs, spices, and various plant extracts had received particular attention as possible alternatives to antibiotic growth promoters (Guo, 2003; Hernandez *et al.,* 2004). Being natural, non-toxic, residue-free, easy availability, and their beneficial effects viz. appetizer, increased digestive enzymes secretion, immuno-stimulant, bactericidal, antiviral and antioxidants made them highly acceptable as natural feed additives for poultry (Singh et al., 2014). Cinnamon (*Cinnamomum zeylanicum*) commonly known as “dalchini" is one of the oldest medicinal plants, widely used as a condiment in India and indigenous to Sri Lanka and South India (Jakhetia *et al.,* 2010).

There has been resurgence of interests for “all natural” medicinal plants like herbal feed additives, plant extracts with growth, flavour, colour enhancing, antioxidant and antibacterial activities (Adodo, 2002; Omojasola and Awe, 2004). Herbal formulations have proved useful in increase in weight gain and less meat: bone ratio beyond doubt. However, there is dearth of data on efficacy of herbal products especially on carcass characteristics and cooking attributes. This study therefore presents the effect of dietary cinnamon powder on the organoleptic properties of cockerel chickens.

## MATERIALS AND METHODS

### Site of the Experiment

The study was carried out at the Poultry Unit of Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. . It is located in the South-western part of Nigeria. The city lies between latitude $8^{0}8^{1}0$”N and longitude 4”$16^{1}0$”E

### Preparation and Collection of Test Ingredient

The test ingredient used was cinnamon powder. It contains 92g per bottle. It was procured in BAYONNE, NJ 07002, U.S.A.

### Experimental Animal and Management

ISA BROWN breed of cockerel was purchased from CHI Farms LTD Ilorin, Kwara State Nigeria. A total of one hundred and fifty (150) 1-day old ISA BROWN cockerel chicks were used to determine the meat quality characteristics of cinnamon powder on cockerel. The cockerel chicks were weighed on arrival and were randomly assigned to five (5) treatments in a completely randomized design with 30 birds per treatment. Each

group was further subdivided into three (3) replicates of ten (10) birds each. The chicks in the control group (T1) were provided with standard basal diet (starters marsh) 0-63 day and growers marsh from 64-112 day. The chicks of the other groups were also provided with the same basal diet (starters marsh) as in T1 along with cinnamon powder at 0.5 (T2), 1.0 (T3), 1.5 (T4) and 2.0 (T5), g/5l of water for a period of 112 days.

**Experimental Diets**

Birds were fed ad libitum on a broiler starter diet containing Crude Protein of 18%, Metabolizable energy of 3000Kcal/Kg for 8 weeks, followed by grower diet containing Crude Protein of 17%, Metabolizable energy of 2300Kcal/Kg

**Test Ingredient and Diet Formulation**

Certain measured quantity of cinnamon was dissolved into 4litters of water per treatment and replicates respectively. The layout goes thus:

$T_1$: 0g cinnamon/4litres of water
$T_2$: 0.1g cinnamon/4litres of water
$T_3$: 0.2g cinnamon/4litres of water
$T_4$: 0.3g cinnamon/4litres of water
$T_5$: 0.4g cinnamon/4litters of water
$T_6$: 0.5g cinnamon/4litters of water
$T_7$: 0.6g cinnamon/4litters of water

**Data Collection**

Data were collected on meat quality characteristics which are color, flavor. Tenderness, juiciness, texture, and overall acceptability following the procedure of Choi *et al.,* 2016.

**Colour**

Meat that were tested for colour should were exposed to air for at least an hour ('blooming'). Moreover, the color was determined by the reflectance of myoglobin, seen through a mesh of water molecules, the thickness of which is pH-dependent. Consequently, simply assessing the heme pigment (30) often does not yield results that are closely related to visual colour ratings.

**Flavor**

The sensory evaluation appeared to be the only reliable method for assessing meat flavor. The flavor of the meats were tested using taste panelists as described by Choi *et al.,* 2016.

**Tenderness**

In these tests, the meat tenderness is measured as the force or energy required to cut (penetrate), tear, or compress (deform) the meat. Well trained panels were used as described by Choi *et al.,* 2016, panel ratings and number of chews are the two general measures considered.

**Juiciness**

Taste panels scoring technique was used, scores were given in the beginning and again at the completion of mastication.

**Statistical Analysis**

All data generated were subjected to a one-way analysis of variance (ANOVA) using the general linear model of statistical analysis system SAS (2000) and separated using Duncan's Multiple Range Test of the same package.

**RESULTS AND DISCUSSION**

There were significant ($p<0.05$) differences between the dietary treatments and the parameters measured.

The cockerel fed diet $T_1$ (control) had the highest meat colour (5.60) which was rated slightly light while other treatments were rated slightly dark. This observation was in line with the findings of Homseng *et al.* (2019) who reported the usage of cinnamon in the diet of broiler chicken had no effect on meat colour irrespective of treatment groups. Govindarajan *et al*. (2018) also revealed that meat colour was not influenced with the use of cinnamon oil and sodium butyrate in the diet of broiler chicken. However, the discovery in this resent study disagreed with the findings of Park (2008); Jaswinder *et al*. (2014); Raskar *et al*. (2018); Akinade (2012); Herawati and Marjuki (2011). These authors claimed significant enhancement of cinnamon powder on meat colour. Park (2008) on effect of dietary cinnamon powder on savor and quality of chicken meat in broiler chickens reported that the color was lighter than those from the control groups. Jaswinder *et al*. (2014) on the effect of cinnamon (*Cinnamomum cassia*) powder as a phytobiotic growth promoter in broiler chickens also reported an improved sensory attributes of the meat as compared to control group. Raskar *et al*. (2018) reported an improvement in meat quality in the feeding of turmeric (*Curcuma longa*) powder to broiler chickens. Akinade, (2012) also, observed that meat quality was improved in the use of garlic (*Alium sativum*), Ginger (*Zingiber officinale rosc*) and their mixture in drinking water of broiler chickens. Herawati and Marjuki, (2011) on effect of feeding red ginger (*Zingiber officinale rosc*) as phytobiotic on broiler slaughter weight and meat quality revealed that feeding red ginger phytobiotic additive increased meat quality of broiler.

Flavor was highest (6.60) for chickens fed with diet $T_5$ which was ranked moderately desirable while chickens fed diet $T_2$ had the lowest (5.40) which was considered intermediate.

This corroborated the findings of Jaswinder *et al*. (2014) who reported that flavor in the use of cinnamon (*Cinnamomum cassia*) powder as a phytobiotic growth promoter in broiler chickens was improved compared to control group. However, the enhanced flavor characteristics discovered in this study against the findings of Govindarajan *et al*. (2018). This author claimed non-significant enhancement of cinnamon powder on flavor. He reported that the supplementation of cinnamon oil and sodium butyrate in the diet of broiler had no influence on the flavor of the meat quality.

The highest tenderness was observed in cockerel fed diet $T_5$ (5.67) which was rated slightly hard while the lowest tenderness was obtained in meat fed diet $T_1$ and $T_4$ (0.0g and 1.5g of cinnamon powder in water respectively) with the value (4.13) which was ranked slightly soft. This was in agreement with the findings of Jaswinder *et al*. (2014) who reported that tenderness was significant in the use of cinnamon (*Cinnamomum cassia*) powder as a phytobiotic growth promoter in broiler chickens compared with the control group. Raskar *et al*. (2018) also reported an improvement in meat quality in the feeding of turmeric (*Curcuma longa*) powder to broiler chickens. However, the enhanced tenderness characteristics of meat quality discovered in this study against the findings of Govindarajan *et al*. (2018) and Homseng *et al.* (2019). These authors claimed non-significant enhancement of cinnamon powder on tenderness. Homseng *et al.* (2019) reported that the usage of cinnamon in the diet of broiler chicken had no effect on meat tenderness irrespective of treatment groups. This is in accordance with the work of Govindarajan *et al*. (2018) who also revealed that meat tenderness was not influenced with the use of cinnamon oil and sodium butyrate in the diet of broiler chicken.

The cockerel fed diet $T_5$ had the highest acceptability (7.60) rated very like while the diet $T_4$ had the lowest (5.00) which was considered intermediate. This was in line with the findings of Homseng *et al.* (2019) who reported that acceptability was significantly higher in groups fed cinnamon powder compared with the control. Raskar *et al*. (2018) also revealed that the use of cinnamon in the diet of broiler chickens had improved meat quality. However, no non-significant effect on acceptability has been reported on the use of cinnamon in the diet of broiler chickens.

The value (5.60) was recorded highest for juiciness for chicken meat fed diet $T_5$ which was considered slightly juicy while the lowest (3.20) was observed for chickens fed diet $T_4$ which was rated moderately dry. This was in agreement with the findings of Raskar *et al*., (2018) who revealed that the use of cinnamon in the diet of broiler chickens had an improved meat quality. This also was in line with the works of Akinade, (2012) who observed that meat quality was improved in the use of garlic (*Alium sativum*), Ginger (*Zingiber officinale rosc*) and their mixture in drinking water of broiler chickens. However, the enhanced juiciness characteristics discovered in this present study differs from the works of Govindarajan *et al*., (2018) and Homseng *et al.* (2019). These authors claimed non-significant enhancement of cinnamon powder on juiciness. Homseng *et al.* (2019) reported that using cinnamon in the diet of broiler chicken had no effect on meat juiciness irrespective of treatment groups. This also corroborated with the work of Govindarajan *et al*. (2018) who also revealed that meat juiciness was not influenced with the use of cinnamon oil and sodium butyrate in the diet of broiler chicken.

**Table 1: Effect of cinnamon powder on meat quality characteristics of cockerel chickens**

| Parameter | $T_1$ (0.0g) | $T_2$ (0.5g) | $T_3$ (1.0g) | $T_4$ (1.5g) | $T_5$ (2.0g) | ± SEM |
|---|---|---|---|---|---|---|
| Colour | $5.60^{a}$ | $4.00^{c}$ | $4.00^{c}$ | $4.80^{b}$ | $4.00^{c}$ | 0.61 |
| Flavor | $6.00^{b}$ | $5.40^{c}$ | $6.60^{a}$ | $4.80^{c}$ | $6.60^{a}$ | 0.68 |
| Tenderness | $4.27^{c}$ | $5.27^{b}$ | $5.40^{b}$ | $4.13^{c}$ | $5.67^{a}$ | 0.85 |
| Acceptability | $7.00^{ab}$ | $6.80^{b}$ | $6.40^{bc}$ | $5.00^{c}$ | $7.60^{a}$ | 0.42 |
| Juiciness | $5.00^{b}$ | $5.20^{b}$ | $6.20^{a}$ | $3.20^{c}$ | $5.60^{a}$ | 0.80 |

abc = Means along the same row with different superscripts are significantly ($p<0.05$) different, SEM = Standard Error of the Mean.

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