



## Growth Performance of Broiler Chicken (*Gallus gallus domesticus*) in Response to Cinnamon Powder as Feed Additives

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### ABSTRACT

One hundred-twenty (120) heads of day-old Cornish-cross broiler chicks were used in the study, which employed a Completely Randomized Design (CRD). The purpose of the study was to evaluate the growth performance of broiler chickens in response to cinnamon powder supplementation. There were four treatments which were replicated three times having 10 broiler chicks per replication. Treatment 1 (T<sub>1</sub>) had 50g cinnamon powder as feed additives, Treatment (T<sub>2</sub>) with 75g cinnamon powder, Treatment 3 (T<sub>3</sub>) with 100g cinnamon powder and the Control group (T<sub>0</sub>) had a basal diet of commercial feeds with no feed additives. The study investigated the growth parameters of broiler chickens for 30 days, after the termination of the study the chickens were slaughtered and weighed to determine the carcass performance of the chickens. After the period of experimentation broiler chickens from Treatment 3 (T<sub>3</sub>) with 100 grams of cinnamon powder obtained the highest live weight compared to other treatments. Also, it was observed in the study that broiler chickens from Treatment 3 (T<sub>3</sub>) had the highest return on investment with 64%.

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## Introduction

The poultry industry is one of the most profitable businesses of agriculture that provides nutritious meats and eggs for human consumption within the shortest possible time. The chicken is the most exploited species of poultry, which is utilized for food production in the whole world. On the other hand, Philippine poultry industry, chickens are ranked one, followed by ducks in economic importance because their products are the main source of meat and eggs. Broiler production and egg production are one of the sunrise industries in the Philippines today. It started as a backyard enterprise but later it shifted to the more commercialized and integrated farming operations. Chickens are one of the most common and widespread domestic animals, with a total population of 23.7 billion as of 2018 from more than 19 billion in 2011 (PSA 2011). Recently, the price of the chicken jump up to 180 to 230 pesos per kilo due to its demand and availability. It is highly nutritious and a good source of protein. Providing commercial poultry feeds all around the period is just not financially feasible, hence there is a need to reduce the cost of poultry production by replacing the costly commercial feed with some comparatively cheaper feed resources. However, this fast-growing industry has been faced with

many backlogs especially in backyard farming because of the prohibition of antibiotic-based feed additives, and the higher cost of feeds. Hence, cinnamon has been seen as an alternative feed additive. Cinnamon powder is renowned for its anti-inflammatory properties. (Adedejie et al., 2021) highlighted the anti-inflammatory effects of cinnamon, suggesting its potential in managing conditions related to inflammation. This includes diseases such as arthritis and certain cardiovascular conditions. In terms of nutritional content, cinnamon is notably low in calories and provides essential nutrients. While it may not be a significant source of macronutrients, such as proteins and fats, it does contain small amounts of minerals like manganese and calcium. Manganese, in particular, plays a crucial role in bone health and metabolism of chickens. Cinnamon's role in modulating immune responses in broiler chickens has also been investigated in a study by (Al-Abdullatif et al., 2023), cinnamon powder supplementation was associated with enhanced immune parameters in broilers. The researchers observed increased antibody titers and improved cellular immune responses, suggesting that cinnamon may contribute to the immunological well-being of broiler chickens. Moreover, the impact of cinnamon on oxidative

stress and antioxidant status in broiler chickens has been a subject of interest. (Kanani et.al., 2016), in a study that reported that cinnamon supplementation led to a reduction in oxidative stress markers and an improvement in antioxidant enzyme activities. These findings indicate that cinnamon may play a role in mitigating oxidative damage in broiler chickens. Thus, this study aimed to determine the growth performance of broiler chicken fed with commercial ration supplemented with varying levels of cinnamon powder.

**Materials and Methods**

**Experimental House and Cages**

The one hundred-twenty (120) day-old broiler chicks were housed in a 160 m<sup>2</sup> stress-free housing within environmentally safe vicinity to ensure high ethical standards. The environment wherein the chicken cages were placed is a bit humid during day time and much colder during night time, hence the used of light and cooler materials were needed. The poultry house was constructed using light materials like bamboo, nipa, binder, and wood to protect the broilers from predators. Anent to this, the living condition of chickens was observed to be in minimum standard requirements, the cages temperature was maintained at 33-32°C on the first week and gradually decreasing it to 18-24°C as the age of the chicken progress. Moreover, the feeder used was a manual feeding of chickens since the experiment is done on smaller population, water troughs or drinkers was also provided still in manual water drinkers, while insuring the availability of water so that the living condition of chicken is maintained. The poultry cages were cleaned and disinfected once every seven days to maintain good hygiene and avoid the entry of pathogens.

**Study Design**

The study was purely experimental and used a Completely Randomized Design (CRD). The study use cinnamon powder mixed in commercial feed. The following were the amount of cinnamon powder used along with commercial feeds; T<sub>1</sub> = 50 grams cinnamon powder with 950 grams of commercial feeds, T<sub>2</sub> = 75 grams of cinnamon with 925 grams commercial feeds and T<sub>3</sub> = 100 grams cinnamon powder with 900 grams commercial feeds respectively, while T<sub>0</sub> (Controlled group) were fed with pure commercial fee. It was conducted at Sibugay

Technical Institute Incorporated (STII) Eco Agro-Tourism Farm Animal Science Experimental Area at Upper Pangil, Ipil, Zamboanga Sibugay from July 17, 2023 to August 17, 2023 covering 30 days period of experimentation.

**Data Collection**

The data obtained from the study were, the weekly weights of broiler chickens starting from the 7<sup>th</sup> day of experimentation until the 30<sup>th</sup> day. Also, data like the dressed weight and Average Daily Gained Weight (ADG) were collected to further evaluate the effects of cinnamon powder.

**Brooding of Chicks**

Brooding of chicks happened when the day-old chicks were brood for at least to 14 days. Using incandescent light bulbs during the day and especially during nighttime, this was done to ensure that the chickens are able to insulate themselves and it enhances their eating habit. Cage doors were closed every night to maximize insulation and avoid cold stress. Other bedding materials such as used newspapers and rubbish cartons were used in order to ensure clean pens. Also, chicks during the brooding period were provided with waterers to keep them hydrated during day time.

Broiler chickens were equally fed with readily available commercial feeds during the first seven days of the study. On the first week of the study experimental treatments were introduced based on the randomization techniques. To ensure the physical and dietary well-being of the experimental animals, a gradual change of feeding was employed. The cinnamon powder used in the study was mixed to commercial feeds as mentioned above, hence the cinnamon was just a supplementation not as part of the formulation.

**Statistical Analyses**

To calculate for significantly different statistical analysis in the growth performance of broiler chickens in response to cinnamon as feed additives, the study used analysis of variance (ANOVA) and using JAMOVI a free and open-source program for data encoding and analysis. When ANOVA results were significant Tukey Honest Significant Difference as post hoc test was done to assess the significance of differences between pairs of the treatment means.

Table 1. Nutritional composition of commercial feeds used in the study

Nutritional Composition of Commercial Feeds used in the Study*					
Chick Booster (1-15 days)		Broiler Starter (16-26 days)		Broiler Finisher (27 – harvest day)	
Crude Protein	Min. 21.50%	Crude Protein	Min. 19.50%	Crude Protein	Min. 18.00%
Crude Fat	Min. 4.00%	Crude Fat	Min. 5.00%	Crude Fat	Min. 6.00%
Crude Fiber	Max. 3.50%	Crude Fiber	Max. 4.50%	Crude Fiber	Max. 5.50%
Moisture	Max. 12.00%	Moisture	Max. 12.00%	Moisture	Max. 12.00%
Calcium	0.85-1.15%	Calcium	0.80 – 1.10%	Calcium	0.80-1.10%
Phosphorus	Min. 0.70%	Phosphorus	Min. 0.70%	Phosphorus	Min. 0.70%

\*One brand was used but remained unnamed in order not to promote the brand

Table 2. Summary of the growth performance of broiler chickens in response to cinnamon as feed additives

	Weight of Broiler Chickens (g)							
	1 <sup>st</sup> week	F	2 <sup>nd</sup> week	F	3 <sup>rd</sup> week	F	30 <sup>th</sup> day	F
T <sub>0</sub>	145.1		368		734.1		1284.7	
T <sub>1</sub>	146.7	12.4*	409.6	34.3*	748.1	33.7*	1292.1	421*
T <sub>2</sub>	152.5		420.9		767		1377.8	
T <sub>3</sub>	159.8		429.9		792		1461.2	

\*Very significant at  $\alpha=0.05$ 

Table 3. Carcass traits of broiler chicken in response to cinnamon powder as feed additives.

Carcass traits	Control (T <sub>0</sub> )	Treatment 1 (T <sub>1</sub> )	Treatment 2 (T <sub>2</sub> )	Treatment 3 (T <sub>3</sub> )
Dressing percentage	53.93	56.32	57.86	62.59*
Dressed weight	26724	26671	28659	30022
SEM	2.16	1.81	5.24	4.85

\*very significant at  $\alpha = 0.05$ 

## Results and Discussions

### Weekly weights of chickens

As presented in Table 2, during the first week after introducing the cinnamon powder as feed additives, chickens from Treatment 3 (T<sub>3</sub>) with 100g cinnamon powder had the highest average weight of 159.8g, followed by Treatment 2 (T<sub>2</sub>) with 152.5g, Treatment 1 (T<sub>1</sub>) with 146.7, and the control group (T<sub>0</sub>) with 145.1g. In the second week of the study, it was observed that still Treatment 3 (T<sub>3</sub>) had the highest average weight of 429.9g, followed by Treatment 2 (T<sub>2</sub>) with 420.9g, Treatment 1 (T<sub>1</sub>) with 409.6g, and the control group (T<sub>0</sub>) with 368g. During the third week of the study, it was found that Treatment (T<sub>3</sub>) had the highest accumulated gained weight of 792g, followed by Treatment 2 with 767g, Treatment 3 had an average weight of 748.1g and the control group had 734.1g, while on the twenty-eighth day of the study; broiler chickens from Treatment 3 (T<sub>3</sub>) had the highest accumulated weight of 1235g, it was followed by Treatment 2 with 1196g, while Treatment 1 had 1190.1g and the control group had an average weight of 1184.5g. On the 30<sup>th</sup> day before the termination of the study, broiler chickens from Treatment 3 (T<sub>3</sub>) had the highest gained weight of 1461.2g, while Treatment 2 had 1377.8g, and Treatment 1 had an average weight of 1292.1g, and the control group had 1284.1g. These results had been subjected to statistical analyses employing analysis of variance (ANOVA), it was found that these averages had a very significant difference among each other suggesting a very efficient response of broiler from cinnamon powder as feed additives since  $p < 0.05$ . Furthermore, using Tukey HSD test it was found that among all treatments, Treatment 3 (T<sub>3</sub>) with 100g cinnamon powder had a significant difference among all other treatments with  $p < 0.01$ .

Moreover, these significant results during the 1<sup>st</sup> week, 2<sup>nd</sup> week, 3<sup>rd</sup> and 30<sup>th</sup> day of the study can be associated with cinnamon powder as a feed additive aligns with the study of (Ali et.al., 2021), which states that cinnamons' bioactive components and microbial effects may enhance nutrient absorption and utilization of animals, contributing to sustained and accelerated growth and health enhancement of the broiler chickens. On the 28<sup>th</sup> day of the study, chickens were found to be responding rapidly to weather-induced stressors, although (Oduyayo et.al., 2021) exclaimed that cinnamon has stress-mitigating effects, it can never be denied that broilers are sensitive types of

chickens (Krauze et.al., 2021). Weather-related stressors such as temperature fluctuations or humidity levels (Apalowo et.al., 2024), may have introduced variability, masking the potential effects of cinnamon powder supplementation. The non-significant outcome during the 28<sup>th</sup> day may underscore the importance of optimizing environmental conditions for supplement efficacy.

### Dressed Weight

The dressed weight of broiler chickens was found to be high in Treatment (T<sub>3</sub>) with 100g cinnamon powder gaining 1203g, it was followed by Treatment 2 with 1146.4g, Treatment 1 had 1067g, while the control group with 1069g average weight. It was found that Treatment 3 with 100g cinnamon powder had a very significant difference compared to other treatments (Table 3). Furthermore, the post hoc analysis revealed that comparing all the mean differences of each treatment Treatment 3 was still very significant with  $p < 0.01$ .

This significant result in dressed weight is in contrast to (Behera et.al., 2020; El-Hack et.al., 2020), wherein their studies they have found that the inclusion of varying levels of cinnamon powder had no significant effect on the carcass traits. Additionally (Khan and Ahmad, 2023) also reported that cinnamon powder supplementation had improved the BWG and FCR of the chicken but had no significant effect on other carcass parameters.

As presented in Table 4, the average daily gained (ADG) weight of broiler chicks was found to be highest at Treatment 3 (T<sub>3</sub>) gaining 47g, followed by Treatment 2 with 45g, while Treatment 1 had 42g and control group had an average of 41.5g respectively. Statistical analysis revealed that there was a very significant difference in the average daily gained weight broiler chickens when varying levels of cinnamon powder was used as feed additives. To further evaluate this significant difference Tukey HSD was employed and it revealed that Treatment 3 with 100g cinnamon powder had a very significant effect on the average daily gained weight performance of broiler chickens.

The results from this study regarding the average daily gained weight of broiler chickens in response to cinnamon powder as a feed additive is in agreement with (Sethy et.al., 2020), in their study they found that broiler chickens' supplemented cinnamon powder had significantly affected

the body weight of the chickens compared to the control group. They also added that broiler chickens supplemented with cinnamon powder had the highest feed conversion ratio (FCR), which led to higher average gained weight. This result also concurs to (Adedeji et.al., 2021) findings, which reflected that the use of cinnamon powder as natural feed additive has a promising effect on the feed intake efficiency, growth performance, and carcass quality of broiler chickens.

Table 4. Average Daily Gained (ADG) weight of broiler chickens in response to cinnamon powder.

Treatments	ADG	F	p-value
Control	41.5		0.633
Treatment 1	42	396**	<0.001
Treatment 2	45		<0.001
Treatment 3	47		<0.001

\*\*Very significant at 0.05

## Conclusions

It has been proven by the study and other relevant studies that cinnamon powder as a feed additive can enhance the weight performance of broiler chicken. The findings suggest that cinnamon's bioactive components contribute to sustained growth promotion, cumulative health benefits, prolonged immunomodulation, stress mitigation, and sustained antioxidant protection. These conclusions are consistent with prior research, highlighting the potential of cinnamon powder as a valuable and effective feed supplement for optimizing the growth, health, and overall well-being of broiler chickens over an extended supplementation period.

## Declarations

### Acknowledgment

The researchers would like to acknowledge the entire faculty of the College of Agriculture of Sibugay Technical Institute Incorporated, for their support and for allowing the researchers to conduct the study in their experimental area.

### Ethical Approval Certificate

This study was cordially approved by Sibugay Technical Institute Incorporated – Animal Science Research Committee, and agreed on the decision and permission was obtained from STII Research Ethics Committee to conduct the study on broiler chickens with cinnamon powder as feed additives on the Animal Science Research Area with approval certificate number 342-STII-0015-2023 dated July 17, 2023 to August 16, 2023.

### Author Contribution Statement

*Ramil B. Entana Jr.*: Investigation, formal analysis, manuscript revision, interpretation of data gathered

*Mary Ann C. Alejandro*: Data collection, investigation, minor manuscript editing

### Conflict of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

## Data Availability

Data used to support the findings of this study are available from the corresponding author upon request.

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