INNSPUB

International Journal of Biosciences | IJB |

ISSN: 2220-6655 (Print); 2222-5234 (Online)

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Vol. 27, Issue: 2, p. 114-121, 2025

RESEARCH PAPER OPEN ACCESS

Anthelmintic potential of powdered papaya seed *Carica papaya* in varying levels against *Ascaridia galli* in broiler chicken

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Key words: Anthelmintic, Nematode, *A. galli*, Papaya, Poultry

DOI: https://dx.doi.org/10.12692/ijb/27.2.114-121 Published: August 10, 2025

ABSTRACT

Parasitic infestation, particularly *Ascaridia galli,* significantly threatens poultry production, reducing growth and productivity. *A. galli,* a nematode that frequently affects chickens, can be treated with a synthetic anthelmintic; however, resistance to commercial dewormers has developed, which can cause harm to poultry. These problems catch the interest of many researchers who are driven to establish plant-based products to minimize costs. This study examines the potential anthelmintic properties of papaya seeds administered to broiler chickens at varying doses. The experiment was patterned in a Complete Randomized Design in which four treatments were observed and replicated into three, with five experimental birds in each treatment: T1-(Control), T2-(1mg PPS/bird), T3-(1.5mg PPS/bird), and T4-(2mg PPS/birds). Treatment 4, with the highest inclusion rate, has shown an excellent result, indicating that powdered papaya seed at this amount can be used as an alternative to commercial dewormers. In comparison, Treatment 3, with an amount of 1.5 mg, yields comparable results to the commercial dewormer. However, powdered papaya seed given in a lower amount yields a poorer result compared to other treatments. The findings in this study indicate that *Carica papaya* seed exhibits significant results against *A. galli*. Future studies should conduct sensory evaluations to assess the effects on the meat of broiler chickens, as well as evisceration activity, to verify the presence of gastrointestinal parasites in the gastrointestinal tract.

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INTRODUCTION

One essential source of protein is chicken, which remains the favorite meat of Filipinos. Broiler chickens are the type of chicken, typically raised for meat production, the most efficient type of poultry to domesticate regarding growth, feed conversion, and yield (Tobias Kettrukat, 2023). The modern commercial broiler weighs over 2 kilograms at 35 days of age and is ready for slaughter with an estimated eviscerated carcass weight of about 25%.

Nowadays, broiler chicken is the leading animal enterprise in the Philippines. Over the past few decades, broiler production has doubled, increasing from around 1 million metric tons (MMT) in 2000 to about 2 million MMT in 2020, with 1.93 MMT of goods produced in 2019. That same year, at current prices, the gross value of chicken production was P173.94 billion in revenue and P179.21 billion in earnings. The rise in pork prices caused by the African swine fever outbreak is why consumers are shifting from pork to chicken (Acosta, 2022).

On the other hand, parasitic infestation is one of the most significant losses for chicken raisers. As parasites invade the area, it could signal an upcoming problem. There are common helminths that may hinder the growth of animals, especially in broilers. One of these common parasites that may infect broilers is *Ascaridia galli,* a nematode found in feces. Infestation of *A. galli* affects broilers' production, welfare, and overall health (Ruhnke, 2017) —*A. galli*, a nematode that frequently affects chickens, can be treated with a synthetic anthelmintic. However, synthetic anthelmintic pose problems due to their high cost, negative effects on poultry meat, and the potential development of resistance if used over an extended period (Prastowo, 2017).

Although chemical anthelmintic have proven effective in eliminating this parasite, there are growing concerns about chemical anthelmintic resistance (World Organisation for Animal Health, 2021). Thus, this study will explore the potential of plant-based anthelmintic alternatives that are not only cost-effective but also sustainable and environmentally friendly, such as papaya seeds.

Carica papaya (papaya or pawpaw), a fruit from the family Caricaceae, originated in the American tropics and has become a well-known and vital fruit crop in the Philippines. Papaya is considered an herbaceous perennial tree with a single, straight trunk that can grow up to 30 feet (Habtemariam, 2019). According to (Zirintunda, Biryomumaisho, Kasozi, & Batiha, 2022), papaya has been extensively studied for its potential as a natural dewormer for poultry. Papaya contains several bioactive compounds with anthelmintic properties, including alkaloids, proteolytic enzymes, and benzyl isothiocyanate (BITC).

Furthermore, *C. papaya* has captured agricultural interest due to its beneficial natural deworming effects. Papaya is well-documented for its anthelmintic properties due to its bioactive compounds, including alkaloids (carpaine), proteolytic enzymes, tannins, and Benzyl isothiocyanate (BITC). These bioactive compounds disrupt the metabolism of parasites, ultimately leading to their death (Roshan, 2014). Papaya offers a range of nutritional benefits, including vitamins A and C, iron, calcium, protein, carbohydrates, and phosphorus (Yebes, 2021).

Thus, this study aimed to address the critical health concern of chickens caused by parasitic infections. Scientific knowledge in exploring the anthelmintic potential of papaya seeds helped small chicken growers find an alternative remedy to the high cost of commercial dewormers, as it provides a practical and affordable approach to maintaining healthy flocks.

MATERIALS AND METHODS

IACUC protocol

Before the study started, the proposal was sent to the Institutional Animal Care and Use Committee (IACUC) for the Cebu Technological University—Barili Campus for compliance and approval.

Site selection of the experimental house

The study was conducted at Talo-ot, Argao, Cebu. The selected area for the broiler house was strategically oriented, with easy access to clean, potable water and electricity. Talo-ot, Argao, Cebu, is situated at approximately 9.9541, 123.6186, on the island of Cebu. At these coordinates, the elevation is estimated at 10.0 meters or 32.8 feet above mean sea level (PhilAtlas, 2020).

Experimental layout and design of treatments

The experiment was patterned in a Complete Randomized Design in which four treatments were observed and replicated into three, with five experimental birds in each treatment. A total of 60 heads of unsexed two-week-old broiler chickens were used in the study.

The following treatments were as follows:
T1 – Commercial dewormer
T2 – Papaya seed powder/bird (1 mg)
T3 – Papaya seed powder/bird (1.5 mg)
T4 – Papaya seed powder/bird (2 mg)

Preparation of experimental house

The experimental house was prepared before the study's commencement. The experimental cages required four square feet of space, a height of 2.4 meters, and were made out of 1-inch mesh wire for flooring and bamboo slats for the walls. The floor of the house was elevated 900 mm above the ground. The roof was made of corrugated G.I. sheets with at least a one-meter overhang to ensure shade and protection from the rain (University of the Philippines Los Baños (UPLB), 2019).

Procurement of experimental birds

Sixty (60) heads of healthy two-week-old broiler chicken, with dry and fluffy feathers, bright eyes, an alert, active appearance, and free from any sign of disease.

Feeding and sanitation of experimental birds

Each treatment had the same quantity of recommended broiler chicken feed. Experimental birds were fed twice daily, at 6:00 a.m. and 5:00 p.m. From the day the two-week-old chicks were purchased, they were fed pre-starter mash, which was gradually introduced with broiler starter mash at 3-4 weeks. At 5 weeks, they were given broiler finisher mash. Broiler chickens were raised in a confined, dry, and well-ventilated area. They were provided with enough food and tap water ad libitum. The feeding schedule was adhered to throughout the study.

Lighting management

The study employed a lighting temperature of 26.7–29.4 °C for 2-to 4-week-old chicks, using an incandescent light bulb, and provided heat only when necessary beyond 4 weeks of age (Department of Agriculture, 2018).

Collection and preparation of treatments

Papaya fruit was gathered from the locality. Using the modified method developed by (Hervé B. Dakpogan, 2019), the seeds of the unripe papaya were removed from the fruit, washed with tap water, and then air-dried for 48 hours. The dried papaya seeds were then ground into a powder.

Plant collection and verification

Fresh papaya leaves and unripe seeds were collected and taxonomically identified at the Biodiversity, Environment and Natural Resources Research Center by Prof. Hemres M. Alburo of Cebu Technological University – Argao Campus.

Application of treatments

The powdered papaya seed was administered to broiler chickens with their drinking water for five days (Hervé B. Dakpogana*, 2019). Birds at T1 were given a commercial dewormer, the dosage of which will be based on the product specification. Birds at T2 were given 1.5 mg of powdered papaya seed per chicken, T3 were given 2 mg of powdered papaya seed per chicken, and T4 were given 2.5 mg of powdered papaya seed per chicken.

Data collection

Sample feces were brought to the laboratory at the Cebu Technological University – Argao Campus for a pre-treatment fecal examination to identify the parasitic eggs in the intestinal portion of the broiler chicken. A feces collection was done early in the morning, in which feces were gathered and placed in an empty container. The container was labeled according to its corresponding treatment. Thereafter, the sample feces were brought to the laboratory and underwent an examination. A fecal evaluation was performed three days before the powdered papaya seed before the administration of the powdered papaya seed to determine the average egg per gram count of parasites, and the examination was repeated for a post-treatment examination.

Statistical analysis

All data were consolidated and transferred to MS Excel for tabulation. The study utilized the Statistical Tool for Agricultural Research (STAR), and the test results were analyzed using Analysis of Variance (ANOVA) for the significant differences among treatments.

RESULTS AND DISCUSSION

The results of an evaluation activity using powdered papaya seed at varying levels against *Ascaridia galli* in boiler chickens are presented in Tables 1 and 2.

Fecalysis

In this phase of the trial, each group of experimental birds underwent fecal egg analysis. Fecal matter was carefully examined at the laboratory. These were done to assess the presence of parasitic eggs in the experimental birds.

Table 1. Means of internal parasites in pre-treatment evaluation

Treatment	Means of internal parasites
T1- Commercial Dewormer	1955.67^{bc}
T2- 1.0 mg PPS	1811.33^{c}
T3- 1.5 mg PPS	2122.00^{ab}
T4- 2.0 mg PPS	2266.67^{a}
CV %	7.36
p-value	0.0275

Thereafter, the laboratory examination confirmed that the experimental birds were infected with internal parasites, as shown in Table 1. Therefore, all the experimental birds are subjected to deworming.

After applying the powdered papaya seed as an alternative dewormer for five consecutive days, the feces excreted were again examined to assess whether the internal parasites were still present after deworming.

Table 2. Means of *Ascaridia galli* eggs in pre-treatment and post-treatment

Treatment	Pre-treatment	Post-treatment
T1- Commercial dewormer	1955.67^{bc}	1033.33^{b}
T2- 1.0 mg PPS/bird	1811.33^{c}	1500.00^{a}
T3- 1.5 mg PPS/bird	2122.00^{ab}	1033.00^{b}
T4- 2.0 mg PPS/bird	2266.67^{a}	911.00^{b}
CV %	7.36	15.49
p-value	0.0275	0.0139

As reflected in Table 2, the eggs per gram of feces were reduced compared to the days the experimental birds were not yet dewormed. Treatment 4, with the highest inclusion rate, has shown an excellent result, indicating that powdered papaya seed at this amount can be used as an alternative to commercial dewormers. In comparison, Treatment 3, with an amount of 1.5 mg, yields comparable results to the commercial dewormer. However, powdered papaya seed given in a lower amount yields a poorer result compared to other treatments.

According to (Salvedia, 2023), results have revealed that after 21 days of incubation, the *C. papaya* extract reduces the *A. galli* eggs by 51-100%. The study also indicates that extracted papaya seeds, betel nut fruit, and cassava leaves can be a plant-based alternative to piperazine (an anthelmintic drug used to treat intestinal worms found in humans and poultry).

Moreover, a study conducted by (Singh *et al.*, 2022), on goats infested with nematodes reported that papaya in aqueous alcoholic extract has 69.84% anthelmintic activity and a 77.27% reduction in fecal egg count.

These findings support the report by (Sugiharto, 2020), which states that papaya seeds are rich in phytochemicals essential for controlling and modulating the population of pathogens in the gastrointestinal tracts of humans and animals. Additionally, (Muhamad, 2017) also stated that several studies have reported the antimicrobial activities of papaya seeds.

CONCLUSION

The findings in this study indicate that *C. papaya* seed exhibits significant results against *A. galli*. Treatment 4 (2 mg of PPS/bird) at the highest inclusion shows an excellent result. On the other hand, Treatment 3 (1.5 mg PPS/bird) had shown a comparable effects to the commercial dewormer, highlighting its potential as an alternative anthelmintic treatment against intestinal invaders such as *A. galli*.

RECOMMENDATION

Future studies should conduct sensory evaluations to assess the effects on the meat of broiler chickens, as well as evisceration activity, to verify the presence of gastrointestinal parasites in the gastrointestinal tract.

ACKNOWLEDGEMENTS

The author would like to sincerely thank the DOST-STRAND N for their support throughout the study. Additionally, the researcher would like to thank Cebu Technological University, specifically the Barili and Argao Campuses, for providing the necessary laboratory facilities.

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