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Comparative study on evaluating effects of turmeric (*Curcuma longa*) and Thyme (*Thymus vulgaris*) supplementation on growth performance of broiler chickens

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ABSTRACT

Using natural products is now more popular among the poultry industry to help broilers do better and stay healthy. This study aimed to measure FI, BWG and FCR to see how turmeric and thyme supplementation affects the growth of broiler chickens. The antioxidant, anti-inflammatory and antimicrobial properties of turmeric (*Curcuma longa*) and thyme (*Thymus vulgaris*) were tested to see how they affected body weight gain (BWG), feed intake (FI) and feed conversion ratio (FCR). This study evaluates the effects of turmeric and thyme supplementation on feed intake, body weight gain, and feed conversion ratio in broiler chickens. Twenty-four day-old broiler chicks were randomly assigned to four treatment groups : Control (P0), Turmeric (P1: 6 g/kg), Thyme (P2: 6 g/kg), and Turmeric + Thyme (P3: 3 g/kg each). Growth parameters were recorded weekly over five weeks. Results showed that the Thyme Group exhibited the highest improvements in FI, BWG, and FCR, followed by the Turmeric + Thyme and Turmeric Group. Statistical analysis was initially conducted using ANOVA and Duncan's Test with a significance level of 5%. Based on the results, supplementation with turmeric, thyme; and their combination resulted in enhancements in body FI, BWG, FCR when compared to Control Group. Thyme supplementation demonstrated the most pronounced effects on every growth parameter.

Introduction

Today, achieving both high growth in broiler chickens and their good health and welfare, while also producing food that meets consumer expectations for purity and lack of contaminants, is very hard. Using antibiotic growth promoters (AGPs) widely in the past worried many people about antibiotic resistance which resulted in new rules and encouragement for safer approaches (Gadde *et al*., 2017; Abreu *et al*., 2023). This has led to more attention being given to natural feed supplements, including herbs, essential oils and plant extracts which increase performance and resistance to infection without harming food safety (Windisch *et al*., 2008; Hashemi and Davoodi, 2011). A sustainable and profitable poultry industry today requires solutions that enhance feed efficiency, support gut health, and boost disease resistance in birds. As a result, there is growing interest in botanical supplements as natural and safe alternatives to conventional growth promoters (Gogoi *et al*., 2019). In particular, natural additives are emerging as promising substitutes for antibiotics in poultry production, as they help maintain gut integrity, strengthen immune function, and improve growth performance without contributing to antimicrobial resistance (Raza *et al*., 2024).

Scientists say that adding turmeric and thyme to feed may have a positive impact on animals. The effects of these nutrients on growth, the immune system, gut health and the production of antioxidants have been checked in several types of farm animals, mostly focusing on broiler chickens (Fallah *et al*., 2013; Kichu *et al*., 2023; El-Hadad *et al*., 2024). The many bioactive compounds in turmeric and thyme give these herbs beneficial effects for poultry (Alsayeqh, 2025). The polyphenol curcumin which turmeric contains, is powerful against chemical damage, swelling and bacteria. Introducing curcumin into a broiler diet helps remove free radicals, moderate inflammation and offer general support for gut function and nutrient uptake (Gupta *et al*., 2013; Hewlings and Kalman, 2017). Thyme has strong antimicrobial properties which come from its containing monoterpenoid phenols called thymol and carvacrol which can fight microbes such as *E. coli* and *Salmonella* (Burt, 2004; Hofmeisterová *et al*., 2024). They also help digestive enzymes and shape the intestines well, so animals end up eating more and grow healthily (Windisch *et al*., 2008). A mix made from these elements could be healthier for chickens than chemical additives.

This study aimed to measure FI, BWG and FCR to see how turmeric and thyme supplementation affects the growth of broiler chickens. The study works to determine how you can use natural additives in broiler feeds so the birds grow better, your profits increase and you contribute to a cleaner, healthier industry.

Materials and methods

Research design

All procedures of this study followed the Animal Care and Use Protocol and were approved by the Animal Care and Use Committee (ACUC) of Airlangga University. All animal procedures were reviewed and granted permission by using approval number: 1.KEH.015.01.2024.

Design and procedure

This experimental study was conducted over a period of 35 days us-

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ing 24 day-old broiler chicks. The chicks were individually housed in cages measuring 30 × 30 × 30 cm, located at the chicken facility of the Faculty of X (X), Universitas X. Prior to the arrival of the chicks, all cages and the surrounding coop area were thoroughly cleaned and disinfected using Benzalkonium chloride (Benzaklin) to ensure a hygienic environment.

The chicks were randomly divided into four treatment groups, each consisting of six birds:
P0 (Control): Basal feed only.
P1 (Turmeric): Basal feed supplemented with 6 g/kg turmeric.
P2 (Thyme): Basal feed supplemented with 6 g/kg thyme.
P3 (Turmeric + Thyme): Basal feed supplemented with a combination of turmeric and thyme, each at 3 g/kg.

Throughout the 7-day adaptation period, environmental conditions were closely managed for the best health and results of the broilers. The temperature was held at 32±2°C during the first seven days and then was decreased by about 3°C every week, finishing at 24±2°C by the end of the study based on normal broiler recommendations. They kept the relative humidity between 50–60% so that the chicks remain comfortable and healthy.

Gradually, herbal supplements were given to the chicks to help them become used to the new foods. The Control group ate the original commercial feed only, whereas both treatment groups were given the same basic diet plus the given herbal supplements. To help the animals follow natural rhythm, the schedule was 16 hours of light and 8 hours of dark. Throughout the study, the chicks were free to drink clean water from waterers that were cleaned and filled with fresh water twice each day to reduce the risk of contamination.

Each chick got feed twice daily and in the first week, each group received a total of 1020 grams of feed. Because of this, every chick was guaranteed an adequate feed amount throughout the study, representing an average of 21 g/day/chick.

All the feed mixtures were made using a mixer each week to make sure herbal supplements were evenly spread in the animals' meals.

Growth performance measurement

Growth performance parameters were recorded weekly for all birds to assess the impact of dietary treatments. These parameters included:
Feed Intake (FI): Measured as the total amount of feed offered minus the feed refused per group on a weekly basis. This value was then averaged per bird to assess consumption patterns and appetite.
Body Weight Gain (BWG): is determined by taking the difference between the first and last body weight readings each week. A digital scale with the required accuracy was used to weigh birds one at a time.
Feed Conversion Ratio (FCR): is calculated by dividing the total feed each group ate by its body weight gain. The FCR explains how effectively birds put their feed to use and a lower FCR means birds become larger and stronger with the same amount of feed.

All measurements were carried out under consistent environmental and management conditions to minimize external variability and ensure data reliability. Measurements were taken on the same day each week and at the same time of day to avoid fluctuations caused by circadian rhythms or handling stress. Multiple replicates per group were included to enhance the statistical validity of the results.

Statistical analysis

To determine if there were important differences between treatment means, one-way Analysis of Variance (ANOVA) was followed by Duncan's Multiple Range Test (DMRT). We chose to consider a result statistically significant if p was less than 0.05. We used standard statistical software for every statistical analysis.

Results

The data presenting the growth performance parameters for each group are organized as follows: feed intake (FI) is shown in Table 1, body weight gain (BWG) in Table 2, and feed conversion ratio (FCR) in Table 3.

Table 1. Average FI of broiler chickens.

Treatment Groups	FI (Mean±SD) (g)
P0	648.250±49.06[a]
P1	718.753±8.52[b]
P2	745.832±21.97[b]
P3	705.240±51.98[b]

[a,b,c] Differences marked with superscripts in the same column show that groups are significantly different based on P<0.05

Table 2. Average BWG of broiler chickens.

Treatment Groups	FI (Mean±SD) (g)
P0	648.250±49.06[a]
P1	718.753±8.52[b]
P2	745.832±21.97[b]
P3	705.240±51.98[b]

[a,b,c] Differences marked with superscripts in the same column show that groups are significantly different based on P<0.05

Table 3. Average FCR of broiler chickens

Treatment Groups	FCR (Mean±SD) (g)
P0	1.788±0.17[b]
P1	1.707±0.09[ab]
P2	1.542±0.08[a]
P3	1.624±0.14[ab]

[a,b,c] Differences marked with superscripts in the same column show that groups are significantly different based on P<0.05

Feed Intake of broiler chickens

The analysis of feed intake (FI) revealed that the thyme group (P2) had the highest mean feed intake, followed by the turmeric + thyme group (P3) and the turmeric group (P1). The control group (P0) exhibited the lowest mean feed intake among all groups.

Furthermore, the results from statistical analysis revealed significant differences between the control group and P1, P2 and P3 (P<0.05). However, no significant differences were observed among the P1, P2, and P3 groups themselves (P<0.05).

Body Weight Gain of broiler chickens

The analysis of body weight gain (BWG) revealed that the thyme group (P2) recorded the highest mean BWG, followed by the turmeric + thyme group (P3) and the turmeric group (P1). The control group (P0) showed the lowest mean BWG among all groups.

Statistical analysis indicated that the control group (P0) showed no significant differences when compared to the turmeric group (P1) and the turmeric + thyme group (P3) (P>0.05). However, the thyme group (P2) demonstrated statistically significant differences compared to all other groups (P<0.05).

Feed Conversion Ratio of broiler chickens

The analysis of feed conversion ratio (FCR) revealed that the Thyme group (P2) had the lowest mean FCR, indicating the highest feed efficien-

cy. This was followed by the turmeric + thyme group (P3). The turmeric group (P1) showed an intermediate mean FCR, while the control group (P0) exhibited the highest mean FCR among all groups, reflecting the lowest feed efficiency.

The control group (P0) was shown through statistics to have the highest FCR and was significantly different from the thyme group (P2) ($P<0.05$). The turmeric group (P1) did not differ significantly from either the control group (P0) or the turmeric + thyme group (P3) ($P>0.05$). The thyme group (P2), which had the lowest mean FCR, showed a statistically significant difference compared to the control group ($P<0.05$). The turmeric + thyme group (P3) showed no significant differences compared to the other groups ($P>0.05$).

Discussion

At 35 days, the thyme-supplemented group (P2) exhibited the highest feed intake (FI), with a mean value of 745.83±21.97 g and a maximum intake of 1350 g. This indicates that thyme supplementation is effective in enhancing feed consumption in broiler chickens. These results are consistent with previous studies, which reported significant increases in FI when thyme oil was added at 100 and 200 mg/kg in broiler diets (Ashayerizadeh *et al*., 2023). Similar to the work by Hassan and Awad (2017), giving thyme powder at 2, 5 or 8 g/kg raised FI, with 5 g/kg having the strongest impact. The turmeric group (P1) demonstrated an average FI of 718.75±8.52 g, with a maximum of 1250 g. The combined turmeric + thyme group (P3) had slightly lower intake than the P1 and P2 groups but still exceeded that of the Control group (P0), with a mean FI of 705.24±51.99 g and a peak value of 1350 g. Whether more or less feed was consumed is consistent with Abdelli *et al*. (2021), but contrary to the results of Durrani *et al*. (2006).

The Control group (P0) had the lowest FI among all groups, with an average of 648.25±49.06 g and a maximum value of 1288 g. Overall, these results support the hypothesis that dietary supplementation with herbal additives enhances feed intake, with thyme appearing to be the most effective among the tested supplements.

The observed improvements in FI in the thyme-supplemented groups may be attributed to the herb's influence on feed palatability and digestive efficiency. Key compounds in thyme (such as thymol and carvacrol) exhibit antimicrobial properties and are known to stimulate metabolic processes and improve nutrient utilization, which can enhance appetite and feed consumption (Burt, 2004; Hassan and Awad, 2017). Additional aromatic constituents like linalool and myrcene contribute to thyme's pleasant scent, while caryophyllene and camphor enhance its flavor profile (Uttara *et al*., 2009; Wang *et al*., 2015; Abdel-Ghaney *et al*., 2017; Liu *et al*., 2022). These compounds likely contribute to the increased palatability of the feed and, consequently, greater intake.

Turmeric also plays a significant role in promoting feed intake. Its primary active compound, curcumin, is known to support gastrointestinal health, improve digestion, and stimulate enzyme secretion, all of which contribute to increased feed consumption (Burt, 2004; EL-Gogary *et al*., 2025). Furthermore, turmeric contains sesquiterpenoids and minor amounts of volatile oils that enhance its aroma and flavor, making the feed more appealing to poultry (Aggarwal *et al*., 2007).

The combined supplementation of turmeric and thyme may produce synergistic effects due to the complementary bioactive compounds found in each herb. These compounds collectively support improved appetite stimulation, enhanced digestive efficiency, and overall better feed utilization, thereby promoting higher feed intake in broiler chickens (Dong *et al*., 2024).

Thyme-fed animals in the P2 group had the best body weight gain (BWG) 35 days after hatching, with a mean of 1126.52±90.08 g and the largest individual weight of 2555 g. Thyme is shown to have a strong beneficial impact on broiler growth performance. Our experiment results agree with those of Fallah *et al*. (2013), who reported that 5 g/kg thyme powder in the feed led to better body weight for broiler chickens. Likewise, researchers Hassan *et al*. (2024) reported that providing the study animals with 2, 5 or 8 g/kg of thyme powder led to improved body weight, the most significant effects being seen with 5 g/kg. It was observed by El-Ghousein and Al-Beitawi (2009) that broilers fed thyme had increased BWG.

Among the groups, P3 had the second-highest BWG, at 1010.08±86.08 g and 2295 g for its largest weight. This reveals that combining the two herbs may create better health benefits. P1 (Turmeric) performed relatively well, with all their pups weighing more than the average of the control group but less than the thyme- or combination-treated pups.

The bird in the Control group (P0) had the smallest BWG, weighing 930.17±89.51 g on average and the heaviest individual was recorded at 1985 g. These results are similar to those reported by Fallah *et al*. (2013) and Hassan *et al*. (2024) who found that phytogenic additives promote growth. Even so, the findings of Emadi and Kermanshashi (2007) fail to show any significant change in BWG with turmeric.

The improvement of BWG by thyme is thanks to its active substances, mainly thymol and carvacrol. By making feeds more appetizing, boosting digestion and increasing how well nutrients are taken up, these substances support better growth in broiler chickens (Fallah *et al*., 2013). Furthermore, curcumin in turmeric has anti-inflammatory, free radical scavenging and digestive-promoting properties which improve an animal's growth and how feed is processed (Durrani *et al*., 2006; Emadi and Kermanshashi, 2007). Taking curcumin might help decrease oxidative stress and benefit your overall well-being which supports healthy weight gain (Badran, 2020).

The use of turmeric and thyme together act on the body's systems so that you get better utilization of nutrients, a more efficient metabolism and improved weight gain (Hassan and Awad, 2017). They indicate that phytogenic feed additives have great potential as alternatives to synthetic growth promoters for poultry feed.

When thyme was added to diets, feed utilization was most efficient, with the lowest average feed conversion ratio (FCR) at 1.542±0.079, reaching a best FCR of 1.45. The third group was turmeric + thyme (P3) and their FCR was 1.624±0.136, with the smallest FCR registered at 1.69. Although the P3 group received multiple supplements, their FCR did not improve as much as it did in the thyme group alone which may show that thyme is better at optimizing feed conversions. This conclusion matches what El-Ghousein and Al-Beitawi (2009) found: FCR was better in broilers given thyme in their diets. According to Weber *et al*. (2012) using thyme essential oil appears to make poultry feed more efficient.

Alternatively, P1 turmeric had a mean FCR of 1.707±0.086, but P0 Control saw the highest and most unfavorable value of 1.788±0.168. Durrani *et al*. (2006) reported that giving 5 grams of sesame-spice turmeric powder per kg of food resulted in fewer animals per kg of feed than if no turmeric was added. In a similar experiment, Nouzarian *et al*. (2011) found that adding turmeric (at levels of 0.3 and 0.6 g/kg) to an aflatoxin-contaminated diet helped chickens use their food better without changing their feed consumption.

The main reason thyme is believed to help with FCR is that its important bioactive compounds, including thymol and carvacrol, bring positive effects to gut health, like managing the intestinal bacteria population, lessening disease-causing microbes and better nutrient absorption (Brenes and Roura, 2010). They also play a part in increasing digestion and supporting the health of the intestines.

However, turmeric works mainly by delivering the health effects of curcumin, a curry powder ingredient with known anti-inflammatory and antioxidant properties. Promoting intestinal health is possible for curcumin through its effects on reducing gut inflammation and providing support for the epithelial layer of intestines, making the animal's diet more efficient (Scazzocchio *et al*., 2020).

Along with many health gains, mixing turmeric and thyme may help boost gut health by making it simpler for the body to absorb nutrients.

Still, the mix of herbs (P3) was less effective than the thyme group (P2) which indicates that the way these herbs influence each other may be challenging to predict. All the same, these results suggest using thyme-based products as good replacements for growth-promoting compounds which help improve how chickens manage their feed.

Above all, this research revealed that supplementing chicken feed with thyme, turmeric and their combination in combination raises FI, BWG and improves FCR, with thyme having the most positive influence on all of these measures.

Thyme particles in the diets (P2) resulted in the greatest FCR, along with the highest FI and BWG. They may become more appealing to consumers thanks to thymol and carvacrol which help spoiler bacteria get out of the body faster and lead to better nutrition. Despite not being as helpful as thyme, adding turmeric (P1) led to better FI, higher BWG and a better FCR than P0, due to the health benefits of curcumin like its anti-oxidant and protection of the gut.

Turmeric and thyme (P3) showed moderate antibacterial activity, standing between the performance of P1 and P2, suggesting that it might work synergistically with thyme. Such a result underlines how phytogenic compounds interact and indicates that the investigation of the best dosage combinations should continue.

In general, the study showed that thyme and other phytogenics can be substituted for synthetic promoters in raising poultry. Giving broilers herbal supplements can increase their weight gain, improve how efficiently they use their feed and enhance their overall health, matching modern efforts for sustainable and antibiotic-free meat production.

Conclusion

This study shows that feed supplementation with turmeric (*Curcuma longa*) and thyme (*Thymus vulgaris*) has a positive effect on the growth performance of broiler chickens, especially on the parameters of feed intake (FI), body weight gain (BWG), and feed conversion ratio (FCR). From the experimental results, the group receiving thyme (P2) gave the best results with increased FI, BWG, and feed efficiency (lowest FCR) compared to the control group and other treatments. Supplementation with turmeric (P1) and a combination of turmeric + thyme (P3) also showed improvements compared to the control, although not as strong as the effect of thyme alone.

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Conflict of interest

The authors have no conflict of interest to declare.

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