

The effect of giving herbal solution in drinking water on body weight gain, live weight, feed conversion, and eviscerated carcass local chicken

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Abstract. Indonesia is rich in herbal plants such as ginger, turmeric, and garlic, which are widely recognized for their health-promoting properties. These herbs contain bioactive compounds—gingerol, curcumin, and allicin—that act as antioxidants, antimicrobials, and digestive enhancers, offering potential benefits for livestock performance. In this study, an herbal solution was formulated by mixing equal parts of ginger, turmeric, garlic, and water. The research was conducted from August to September 2023 at the Poultry Production Laboratory and aimed to evaluate the effects of herbal solution supplementation in drinking water on the performance of local chickens. A total of 100 day-old local chicks, both male and female, were randomly assigned to four treatment groups with five replications each: T0 = drinking water only (control), T1 = 0.5% herbal solution, T2 = 1.0% herbal solution, and T3 = 1.5% herbal solution. The chickens were raised for 70 days, and performance parameters such as body weight gain, final live weight, feed conversion ratio, and eviscerated carcass yield were measured. Data were analyzed using analysis of variance (ANOVA) followed by Duncan's multiple range test. The results indicated that supplementation with 1.0% herbal solution in drinking water yielded the most favorable outcomes across all measured parameters.

1 Introduction

Various herbal plants thrive in Indonesia and are widely used by the population as traditional medicine and culinary spices. In recent years, these herbs have also gained popularity in livestock production as natural alternatives to antibiotic growth promoters (AGPs), which have been banned by the government due to their adverse effects on human health [1]. Common herbs used in local chicken farming include ginger, turmeric, and garlic. These plants contain bioactive compounds such as gingerol, curcumin, and allicin, which possess antioxidant, antimicrobial, and digestion-enhancing properties [2]. Local chickens, typically raised in rural areas, often lack access to modern veterinary care, making herbal remedies a

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more practical and accessible option for farmers. In village settings, administering herbal additives through drinking water is preferred due to its convenience and ease of use.

Local chickens are known for their slower growth rate, making feed additives essential for improving their performance. Herbal plants have long been recognized for their health benefits and positive effects on livestock productivity. As noted by Widjastuti et al. [3], active compounds in ginger and turmeric stimulate bile secretion and pancreatic enzyme release, including amylase, lipase, and protease, enhancing the digestion of carbohydrates, fats, and proteins. A combination of red ginger and turmeric flour has been shown not to negatively affect average daily weight gain, supporting its use as a feed additive in broiler diets when administered at appropriate doses. Ginger is particularly effective in addressing gastrointestinal issues and improving circulation, while turmeric is rich in antioxidants that support liver function and aid digestion. Recent studies have shown that herbal solutions significantly enhance final body weight in chickens. For example, a 1% ginger, turmeric, and garlic (GTG) solution improved growth and feed efficiency in Super Native Chickens, indicating more effective feed-to-body mass conversion. Despite these benefits, productivity in local chicken farming remains a challenge. Improving growth performance and carcass yield is essential to enhance the economic viability of smallholder operations. Natural interventions such as herbal solutions offer a sustainable approach to improving local chicken production while aligning with consumer preferences for antibiotic-free poultry products. The purpose of this study was to assess the effects of herbal solution supplementation in drinking water on body weight gain, live weight, feed conversion ratio, and eviscerated carcass yield in local chickens. The findings are expected to add to the increasing body of research on natural growth promoters and contribute practical guidance for their use in small-scale and traditional poultry production systems.

2 Materials and methods

This study involved 100-day-old local chicks (DOC) with a body weight coefficient of variation of 9.31%. The flock consisted of a mix of male and female chickens throughout the rearing period. The chicks were randomly assigned to four treatment groups based on different concentrations of herbal solution in their drinking water, with each treatment replicated five times. The chickens were reared for 10 weeks. The herbal solution was prepared using fresh ginger, turmeric, garlic, and water in equal proportions by weight (1:1:1:1). These ingredients were blended using a juice extractor to obtain the liquid herbal extract. The equal weight ratio was selected to ensure a balanced contribution of bioactive compounds from each herb and to facilitate practical preparation and standardization of the solution.

The treatments were as follows: T0 = drinking water without herbal solution (control); T1 = drinking water + 0.5% herbal solution; T2 = drinking water + 1.0% herbal solution; T3 = drinking water + 1.5% herbal solution. During the first week, the chickens were fed a commercial starter ration containing 21.5–23.8% crude protein, 5% crude fat, 5% crude fiber, 8% ash, 0.8–1.1% calcium, 0.5% phosphorus, 14% moisture content, and metabolizable energy (ME) of approximately 3100 kcal/kg. From week 2 to 10, they received a grower ration with 16% crude protein, 3% crude fat, 8% crude fiber, 8% ash, 0.9–1.2% calcium, 0.55–1% phosphorus, 13% moisture content, and ME of around 2850 kcal/kg. The ration, provided in crumble form, was offered *ad libitum*.

Herbal drinking water was administered at half of the birds' daily water requirement, with increasing dosages by age: 5, 10, 15, 20, 25, 35, 45, 55, 65, and 75 ml/bird/day from weeks 1 through 10, respectively. Before receiving the herbal water, the chickens were fasted for four hours to ensure immediate consumption. After the herbal water was finished, plain

drinking water was provided ad libitum. This method allowed accurate measurement of herbal solution intake.

The chickens were housed in pens measuring 75 cm × 90 cm × 70 cm, with a base of rice husk and wire mesh enclosures. The measured parameters included feed consumption, body weight gain, slaughter weight, feed conversion ratio (FCR), and carcass yield—standard indicators for assessing poultry productivity and efficiency. Feed consumption provides insights into palatability and feeding behavior, while body weight gain serves as a primary measure of growth performance [4]. Slaughter weight reflects the final market value, and FCR evaluates the efficiency of feed utilization, with lower values indicating better performance. Carcass yield indicates meat production and is crucial for profitability and processing outcomes [5].

Statistical analysis was carried out using Analysis of Variance (ANOVA), followed by Duncan's Multiple Range Test for mean comparison. Drawing from previous studies that demonstrated the growth-enhancing properties of phytogetic additives such as ginger, turmeric, and garlic [2]. It was anticipated that administering a 1.0% herbal solution through drinking water would lead to significant improvements in feed intake, weight gain, final body weight, feed efficiency, and carcass production in local chickens.

3 Results and discussion

The effects of adding herbal solutions to the drinking water of local chickens over a 10-week period are presented in Table 1 and Figure 1. The results show that herbal supplementation had no significant effect on feed consumption. This is likely because all chickens received the same type of feed, and the presence of herbs in the drinking water did not interfere with their appetite. Feed intake is primarily influenced by factors such as energy content, palatability, and the physical characteristics (bulkiness) of the ration.

Table 1. Results of adding herbal solutions to local chickens

No.	Parameter	T0	T1	T2	T3
1.	Ration consumption (g/week)	414,94 ^a	409,74 ^a	407,25 ^a	416,00 ^a
2..	Body weight gain (g/week)	91,79 ^a	102,53 ^b	104,31 ^b	101,81 ^b
3.	Feed Conversion Ratio	4,54 ^b	4,02 ^a	3,91 ^a	4,09 ^{ab}
4.	Slaughter weight (g)	860,20 ^a	1056,40 ^b	1001,60 ^b	972,40 ^b
5.	Carcass weight (g)	550,00 ^a	660,80 ^b	610,80 ^b	599,00 ^{ab}
6.	Carcass percentage (%)	63,87 ^a	62,54 ^a	61,13 ^a	61,56 ^a

Note: Same column with different superscript indicates significant effect ($P < 0.05$) of the treatment

Despite no notable changes in feed intake, the inclusion of ginger and turmeric in broiler diets has been shown in earlier studies to significantly boost average daily gain (ADG) and improve feed conversion ratio (FCR). This indicates that phytogetic additives such as ginger, turmeric, and garlic can promote growth and optimize feed utilization independently of consumption levels. For example, [6] reported that a diet enriched with these three herbal ingredients led to enhanced ADG and lower FCR, reflecting improved digestive efficiency and nutrient absorption. Ginger is known to contain active compounds like gingerol, shogaol, and zingerone, which exhibit antioxidant, anti-inflammatory, and digestion-supporting properties [7]. It also encourages the release of digestive enzymes, supporting better nutrient uptake and intestinal function. Turmeric's main compound, curcumin—a well-known polyphenol—offers strong anti-inflammatory effects and liver-protective benefits. It also contributes to a healthier gut microbiome, supports fat metabolism, and boosts immune responses [8]. Meanwhile, garlic provides allicin, a sulfur-based bioactive compound with

powerful antimicrobial and immune-enhancing effects. Allicin aids in reducing harmful gut bacteria, supports gut lining integrity, and promotes more efficient use of feed nutrients [9].

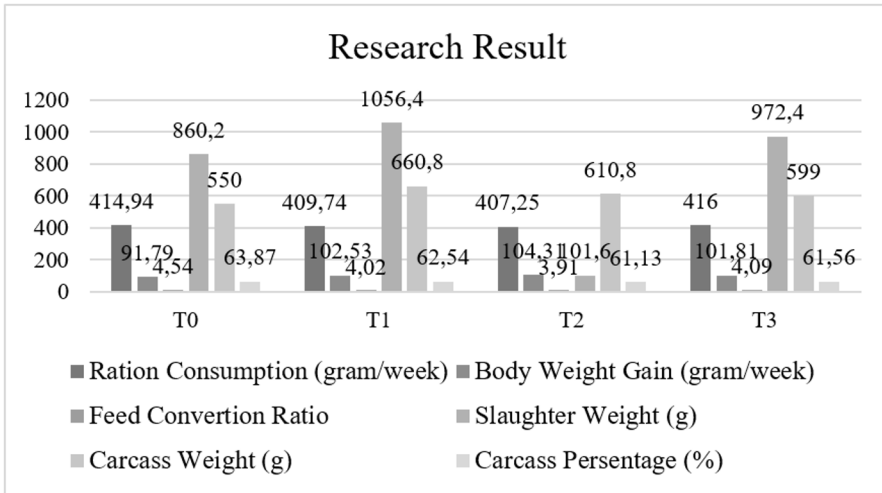


Fig 1. Results of Adding Herbal Solution to performance, slaughter weight, and carcass

The chickens that received herbal supplementation in their drinking water exhibited a significantly greater increase in body weight ($P < 0.05$) compared to the control group. Findings suggest that a 0.5% concentration is already effective in promoting growth, and raising the dosage to 1.5% does not provide additional benefits—in fact, overly high concentrations might hinder weight gain. The most favorable results appear within the 0.5% to 1.0% range. These observations are consistent with the study by [3], which reported that combining red ginger and turmeric flour as feed additives had no adverse effect on weight gain and was beneficial when used at suitable levels. As explained by Widjastuti et al. [10], red ginger and turmeric contain bioactive compounds that stimulate bile secretion and enhance the activity of digestive enzymes such as amylase, lipase, and protease. These enzymes play a vital role in digesting carbohydrates, fats, and proteins from the diet. This physiological response likely contributes to the observed improvement in weight gain, even when feed intake remains unchanged.

Recent studies continue to demonstrate the beneficial effects of ginger, turmeric, and garlic supplementation on broiler performance. Joshi et al. [11] reported that dietary inclusion of 1.5% turmeric powder significantly increased body weight gain in broilers without affecting feed intake, suggesting improved nutrient utilization and digestive efficiency. These improvements are directly linked to the bioactive compounds in these herbs, curcumin in turmeric, allicin in garlic, and gingerol in ginger, which are well known for their antioxidant, antimicrobial, anti-inflammatory, and digestion-enhancing properties ([8];[9]). These findings reinforce the potential of herbal supplementation as a natural and sustainable alternative to synthetic growth promoters in poultry nutrition.

As shown in Table 1, the feed conversion ratio (FCR) in chickens given 0.5% and 1.0% herbal solution in drinking water were lower ($P < 0.05$) compared to the control group, ($P < 0.05$) indicating improved feed efficiency. However, at the 1.5% supplementation level (T3), the FCR increased and showed no significant difference from the control group. Interestingly, the FCR in T3 was also not significantly different from those in T1 (0.5%) and T2 (1.0%). Among the treatments, the 1.0% herbal solution was the most effective in improving feed efficiency. FCR is influenced by both feed intake and body weight gain; if

feed consumption remains constant but weight gain increases, the FCR decreases, indicating better efficiency.

The observed decrease in feed conversion ratio (FCR) with the use of herbal supplements is likely linked to physiological processes triggered by the bioactive constituents in the mixture. Ginger contains gingerol, its key active compound, which promotes digestion by stimulating the release of enzymes like amylase, lipase, and protease. These enzymes enhance nutrient breakdown and absorption, facilitating more efficient transformation of feed into body mass. This supports the findings of [12], who reported that ginger acts as a digestive aid, improving feed efficiency. Enhanced enzymatic activity enables more effective degradation of proteins, fats, and carbohydrates into absorbable units in the small intestine, thereby promoting growth and contributing to lower FCR values. Besides gingerol, turmeric contains curcumin, a compound with multiple health benefits, including improved metabolic processes and digestive function. Curcumin also serves as a strong antioxidant, combating oxidative stress in intestinal tissues, and its antimicrobial action helps control the proliferation of harmful gut microbes. Garlic, on the other hand, contains allicin, a powerful natural antibiotic that inhibits pathogens such as *E. coli* and *Salmonella* sp., which are common in poultry intestines. By minimizing the pathogenic load, garlic enables birds to redirect energy from immune defense toward growth, thereby enhancing feed efficiency. Overall, incorporating herbal supplements into drinking water offers an effective and natural alternative for improving poultry growth performance and reducing dependence on synthetic growth promoters.

The addition of herbal supplements to the drinking water of local chickens significantly increased their slaughter weight ($P < 0.05$) compared to chickens that received no supplementation. Nevertheless, there were no notable differences in slaughter weight among chickens given 0.5% (T1), 1.0% (T2), or 1.5% (T3) concentrations of the herbal mixture. This indicates that a 0.5% dosage is adequate, as higher concentrations did not produce further improvements. The enhanced slaughter weight is likely attributed to the combined effects of bioactive compounds found in ginger, turmeric, and garlic. Prior research has shown that ginger contains potent antioxidants that can strengthen poultry's immunity. Turmeric, which includes 3–5% essential oils, curcumin, starch, and resin [13], contributes by balancing gastric acid secretion and minimizing excessive intestinal movement, while curcumin acts as a strong antimicrobial agent. Garlic, rich in essential oils with antiseptic and antibacterial properties, is also recognized for boosting endurance and disease resistance. Its active ingredients help slow down intestinal movements and suppress harmful gut bacteria, leading to improved nutrient absorption and more efficient growth.

Carcass weight also improved with the addition of herbal solutions. Chickens in the T1 (0.5%) and T2 (1.0%) treatment groups showed significantly higher carcass weights ($P < 0.05$) than those in the control group (T0). These findings align with previous research [1], which found that adding up to 1% of a ginger-turmeric mixture to broiler diets positively affected growth and carcass weight. However, the carcass weight in the T3 (1.5%) group was not significantly different from the T0, T1, or T2 groups and showed a slight decline compared to the 0.5% and 1.0% groups. This may indicate that an excessive concentration of bioactive compounds reduces their effectiveness. As with many bioactive substances, optimal efficacy is achieved at moderate doses—too little or too much can reduce the desired effects. Carcass weight is closely related to slaughter weight; thus, higher slaughter weights generally yield higher carcass weights at the same age. Supporting this, [14] reported that broilers given 1% turmeric solution showed improved body weight and feed efficiency, leading to better carcass outcomes. Similarly, Egenuka et al. [15] found that ginger supplementation resulted in superior live weight and growth rate, thereby indirectly improving carcass yield.

In contrast, herbal supplementation did not significantly affect carcass percentage in this study. Carcass percentage reflects the proportion of carcass weight relative to total body weight and is generally stable when chickens are of similar age and body condition. Significant differences in carcass percentage are more likely to emerge with variations in age, as body composition shifts with growth. As chickens mature, muscle mass tends to increase—particularly in areas like the wings—while the relative weight of early-maturing parts such as the head, neck, feet, and internal organs decreases, altering overall body proportions.

4 Conclusion

Supplementing drinking water with herbal solutions has been shown to positively influence several performance parameters in local chickens, including body weight gain, feed conversion ratio, slaughter weight, and carcass weight. However, it did not significantly affect feed intake or carcass percentage. Among the treatments tested, administering the herbal solution at a 0.5% concentration in drinking water produced the most favorable results across all key performance indicators.

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