Research Article

Chemical Potential of Burahol (*Stelechocarpus burahol)* Leaf Extract (BaLE) and Its Role as a Promoter of Metabolism and Growth in Broiler

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Abstract | Animal nutrition and animal welfare are two aspects that must be strictly considered in rationing and livestock farming. Exploring the phytochemicals in Burahol leaves and their benefits for broilers is a strategic area of research. Therefore, this study examined the potential of Burahol leaf extract (BaLE) as an antioxidant, inducer of metabolism and feed efficiency, and stimulator of broiler performance. Two hundred broiler chicks, with an average initial weight of 44.67 g, were randomly distributed into four BaLE treatment groups; each treatment was repeated five times, so each experimental unit had 10 broiler samples. The BaLE levels in the ration were given as follows: BaLE-0: Basal Ration, without BaLE; BaLE-1: Basal Ration + 50 mg BaLE/kg ration; BaLE-2 and BaLE-3 were 100 and 150 mg BaLE/kg ration, respectively. The results showed that BaLE strongly scavenged free radicals (IC50 = 6.84 ppm), as indicated by its total antioxidant activity *in vivo*, reaching 6.79 mg/dL (BaLE-2) ($P<0.05$) compared to the experimental groups without and with BaLE. In addition, the administration of BaLE-2 was able to significantly ($P<0.05$) stimulate metabolism, such as an increase in total protein, albumin, and glucose, namely 7.85, 6.28, and 125.89 g/dL, respectively. Similarly, specific proteins such as insulin (6.33 ng/dL) and its receptor (4.65 ng/dL), as well as its transporter, such as Insulin GFBP-4 (3.81 ng/dL), and economically, it can increase animal productivity with better performance ($P<0.05$) compared to BaLE-0 and other levels, as indicated by higher growth (final body weight 1637 g) and better feed efficiency with the administration of BaLE-2.

Keywords | Animal nutrition, Animal productivity, Broiler, Phytochemistry, Metabolism

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INTRODUCTION

The poultry industry's input, mainly feed, is becoming more competitive, not just in quality but also in cost. The increasing price of traditional feed has prompted industry players and researchers to seek more affordable alternatives, such as tropical plants rich in nutrients and bioactive compounds. Studies have shown and confirmed that tropical plants are highly effective feed additives with multiple benefits (Flees *et al*., 2020).

Phytoadditives from various types of plant leaves have attracted significant attention as alternative growth promoters, antibiotics, and animal metabolism stimulators, showing promising effects on the performance and immunity of commercial poultry (Manin *et al*., 2024). These efforts align with the growing demand for sustainable feed additives from natural sources, which can improve feed utilisation, enhance growth, and strengthen the immune systems of commercial poultry. Research results show that leaf extracts from plants such as mulberry (*Anacardium occidentale)* and banana have proven effective in improving growth performance and regulating blood parameters in broiler chickens (So-In and Sunthamala, 2022).

Other studies indicate that supplementation with *Dendrobium officinale* leaves has been shown to enhance immune function, antioxidant status, and growth in broiler chickens (ABCD), while *Annona muricata* leaf extract prevents disease and promotes gut health, ultimately improving growth performance (Abdelli *et al*., 2021; Aritonang *et al*., 2024). Bioactive compounds derived from plants, including phenolic compounds and flavonoids, generally possess antioxidant, antimicrobial (Chen *et al*., 2023), and anti-inflammatory properties (Kharazi *et al*., 2022), thereby positively influencing nutrient digestion capacity and overall physiological responses in poultry (Mushawwir *et al*., 2023). These phytogenic additives, containing some metabolites such as coumarins, lignans, and flavonoids (Meligy *et al*., 2023; Muhammad *et al*., 2023), are increasingly recognised for their benefits as antimicrobial, anti-inflammatory, and antioxidant compounds that can significantly influence animal productivity (Li *et al*., 2022).

Beyond these general effects, specific phytogenic compounds like thymol and carvacrol have been shown to increase weight gain, improve feed efficiency, and reduce feed intake, enhancing antioxidant activity and immune response in broiler chickens (Kuka *et al*., 2023). Furthermore, phytobiotics are known for their ability to protect against pathogenic microorganisms by disrupting cellular barriers and stimulating beneficial gut bacteria such as *Lactobacillus* spp. and *Bifidobacterium* spp. (Adriani *et al*., 2024; Firmansyah *et al*., 2024). These compounds also contribute to the overall resilience of poultry by modulating the immune response, as demonstrated by increased antibody titres (Meligy *et al*., 2023) and gene and lysozyme activity (Dudi *et al*., 2023; Chen *et al*., 2023), which ultimately enhances disease resistance.

Burahol (*Stelechocarpus burahol*) is a tropical plant with significant potential due to its widespread distribution, abundance, and the quality of its chemical properties compounds. Its chemical makeup and antimicrobial activity in vitro are extensively documented (Obianwuna *et al*., 2024). Research (Purwanti *et al*., 2024) indicates it is rich in antioxidants and effective at scavenging free radicals (Sirivibulkovit *et al*., 2018). *In vitro* studies (So-In and Sunthamala, 2022) show that tannins and saponins from Burahol leaves function as potent broad-spectrum antimicrobials, especially as antifungals. However, the application of BaLE in broiler feed and its efficacy have not been reported. Most research has focused on BaLE's in vitro properties and chemical potential, with no in vivo studies on feed supplementation, oral administration, or other delivery methods to evaluate its impact on chicken metabolism, particularly in broilers.

Based on previous reports, considering the potential of Burahol leaves, it is essential to examine their effectiveness in vivo in broilers. The current study aims to explore the phytochemical content of BaLE, its potential in modulating metabolism, and its effects on broiler growth.

MATERIALS AND METHODS

Animal samples, experimental design, and basal diet

An *in vivo* experiment to test the effectiveness of using BaLE in feed was conducted using 200 broiler chicks with an average initial weight of 44.67 g. The sample chickens were randomly distributed into four BaLE treatment groups; each treatment was repeated five times, so each experimental unit contained 10 broiler chick samples. A total of 20 cages were used as experimental units, each measuring 1 x 1.5 m and equipped with feeding and drinking troughs. The temperature and humidity of the cage were strictly maintained during the experimental period, at 25°C and 75%, respectively.

The basal ration used in this experiment was in pellet form and consisted of a mixture of feed ingredients, including corn flour, fish meal, soybean meal, rice bran, bone meal, coconut meal, and coconut oil. Before being pelletized, the feed was evenly mixed with BaLe at the specified treatment concentration. The nutrient content of the feed ingredients used and the nutritional content of the experimental rations are shown in Tables 1 and 2.

Table 1: The nutrient content of the feedstuff.

No	Feedstuff	ME (kcal/kg)	CP (%)	EtE (%)	CFb (%)	Ca (%)	P (%)	Lys (%)	Met (%)
1	Corn flour	3454	8.35	6.47	4.59	0.002	0.02	0.10	0.26
2	Rice bran	2400	9.96	7.20	22.50	0.20	1.00	0.45	0.25
3	Soybean meal	2550	48.00	0.50	3.00	0.20	0.37	2.87	0.64
4	Fish meal	3009	51.69	8.44	0.10	5.50	2.80	6.10	1.70
5	Coconut meal	1519	22.44	12.97	15	0.20	0.20	0.48	0.32
6	Coconut oil	8630	0.00	93.96	0.00	0.00	0.00	0.00	0.00
7	Bone meal	0.00	0.00	0.00	0.00	24.1	12.2	0.00	0.00

Table 2: Metabolisable energy and nutrient content of the basal feed in the experimental study.

ME-Nutrients	Starter	Finisher
CP (%)	22.0	20.0
Lys (%)	1.30	1.20
Meth (%)	0.50	0.45
Cysteine (%)	0.22	0.22
Valine (%)	0.22	0.22
Tryptophan (%)	0.21	0.22
EtE (%)	5.50	5.00
CFb (%)	5.00	5.00
Ca (%)	1.00	0.90
ME (kcal/kg)	3220	2950

CP: crude protein; Lys: Lysine; Meth: Methionine; Cys: Cysteine; Val: Valine; Try: Tryptophan; EtE: Ethanol Extract; CFb: Crude Fiber; Ca: Calsium; ME: Metabolisable Energy; P: Phosporus.

Feed and water are available ad libitum in the morning and evening. The BaLE levels in the diet follow the treatment design: BaLE-0 is the Basal Ration without BaLE; BaLE-1 includes 50 mg BaLE per kg of ration; BaLE-2 and BaLE-3 contain 100 mg and 150 mg BaLE per kg of ration, respectively.

Preparation of BaLE and phytochemical analysis

Extraction: BaLE was obtained by drying Burahol leaves in the sun and grinding them into powder. 500 g of Burahol leaf powder was then macerated with 96% ethanol (1:2 w/v). The container was covered and stored for 48 hours, with occasional stirring. The residue was then filtered and macerated again for 48 hours. After filtering, the ethanol extract was concentrated in a rotary evaporator, leaving a thick ethanol extract.

Quantitative analysis of phytochemical potential began with preparing a quercetin standard solution with five concentrations and a quercetin standard curve. The determination of flavonoid, tannin, steroid, saponin, and alkaloid content was carried out using the wavelength measurement method with a spectrophotometer, with a standard preparation method based on (Aritonang *et al*., 2025). The ability to capture free radicals or antioxidant activity was analysed using the DPPH measurement method described by previous researchers (Sirivibulkovit *et al*., 2018).

Blood sampling and sample analysis

All biochemical blood analyses, including assessment of antioxidant activity, metabolites, and insulin-related proteins, were conducted using plasma samples. Blood plasma was extracted from whole blood collected from the right wing vein with a syringe and a 3 mL tube containing an anticoagulant. Samples were taken from experimental chickens at 35 days of age or at the end of the BaLE treatment, with five samples per experimental unit. Measurement analysis of all parameters was conducted according to the procedures outlined in the Biolabo and Randox kits, and spectrophotometry was used to determine the concentrations of all biochemical parameters. At the same time, insulin levels, receptors, and other specific proteins were measured using an ELISA protocol based on the Mybioresource kit.

Data analysis

All analysis results were thoroughly tabulated and organised according to the importance of the data, given the nature of the study in this research. Data that were ready and suitable for analysis were then subjected to analysis of variance (ANOVA) to determine the degree of influence of the experiment, using a completely randomised design, with 95% precision (α= 0.05). Differences between treatments were determined using Duncan's multiple range test, with the same degree of accuracy.

RESULTS AND DISCUSSION

BaLE phytochemical content and antioxidant capacity

The chemical composition of BaLE and its antioxidant capacity in capturing free radicals, based on the results of this study, are shown in Table 3.

Table 3: Phytochemical content of BaLE and its antioxidant capacity.

Description	% (w/w)	IC_{50} (ppm)
Chemical concentration		
Flavonoids	26.73	
Tannin	0.14	
Steroid	3.27	
Saponin	4.72	
Alkaloid	21.38	
Ascorbic antioxidant acid (Vitamin C)		5.27
BaLe (96% Ethanol Solvent)		6.84

The phytochemical content of the extract used as a feed additive in this study consists of flavonoids, tannins, steroids, saponins, and alkaloids, with the largest composition being flavonoids and alkaloids at 26.73% and 21.38%, respectively (Table 3). This chemical composition strongly supports its ability to modulate metabolism, particularly its antioxidant capacity.

Spectrophotometer and chromatography methods have been widely used to identify and quantify bioactive compounds contained in plant extracts to understand their potential therapeutic and nutritional properties (Alharthi *et al*., 2023). This analysis must reveal the phytochemical profile, including phenolic acids, flavonoids, and other secondary metabolites.

The phytochemicals in BaLE, as assessed by in vitro free-radical-capture testing, demonstrated high capacity (Table 3). The results of the DPPH method showed that BaLE could capture free radicals at 6.84 ppm (IC_{50}), slightly higher than the ascorbic acid standard at 5.27 ppm. Several previous studies reported that an IC_{50} value below 25 ppm indicates vigorous antioxidant activity (Ogbuewu and Mbajiorgu, 2024); the lower the IC_{50} value, the greater the antioxidant activity of the natural ingredient. The IC_{50} value obtained in the current study is lower than that of the same extract with a lower ethanol solvent concentration (Olabode *et al*., 2025).

Blood biochemistry

Table 4 presents the effects of BaLE levels on blood plasma biochemistry, including metabolites as markers of free radical activity, and on plasma biochemical profiles.

The antioxidant activity exerted by BaLe (P<0.05) compared to BaLE-0 or its ability to scavenge free radicals is evident from the decrease in MDA levels as a metabolite product of fatty acid oxidation by free radicals. Table 4 shows MDA concentrations of 0.12 mg/dL in the experimental group without BaLE (BaLE-0), which is higher (P < 0.05) compared to the administration of BaLE (the lowest groups being BaLE-2 and 3, at 0.05 and 0.05 mg/dL, respectively). Previous studies using plant extracts (Mushawwir *et al*., 2023; Urban *et al*., 2024) have shown that garlic extract has strong potential to capture free radicals. Other researchers have shown that plants as a whole contain bioactive compounds such as flavonoids, tannins, saponins, and alkaloids that have the potential to be good antioxidants (Tanuwiria *et al*., 2023; Urban *et al*., 2024).

Table 4: Average concentrations of free radical activity markers and metabolites in broiler plasma at various BaLE levels.

Plasma biochemistry	Treatment groups			
	BaLE-0	BaLE-1	BaLE-2	BaLE-3
Marker of free radical activity (mg/dL)				
γ-Glutaric transpeptidase	7.73[a]	5.36[a]	3.74[b]	4.33[c]
Malondialdehyde (MDA)	0.12[a]	0.08[a]	0.05[b]	0.07[b]
Total antioxidants	3.05[a]	5.82[b]	6.79[c]	5.47[d]
Metabolic (g/dL)				
Total protein	4.27[a]	6.36[b]	7.85[c]	5.17[d]
Albumin	2.96[a]	4.02[a]	6.28[b]	4.64[c]
Glucose	114.21[a]	121.16[b]	125.89[c]	124.66[d]
Pyruvate	3.04[a]	3.69[b]	4.13[b]	3.86[c]
Glucose-6-phosphate	5.66[a]	7.84[b]	9.38[c]	8.95[b]
Triglycerides (TAG)	172.94[a]	157.33[b]	127.28[c]	135.05[d]
Non-esterified fatty acids (NEFA)	2.63[a]	3.96[b]	5.47[c]	4.09[b]
Total cholesterol	133.63[a]	114.77[b]	94.26[c]	109.38[b]

The average plasma biochemical levels with different superscript letters on the same row indicate a significant difference (P < 0.05).

Specifically, flavonoids, as contained in BaLE, are reported to have high antioxidant capacity both in vitro and in vivo, as reported in ducks (Ogbuewu and Mbajiorgu, 2024), in broilers (Zhao *et al*., 2023), and even in ruminants (Tanuwiria *et al*., 2022). In addition to flavonoids, Kuka *et al*. (2023) have isolated alkaloids and reported their very high antioxidant capacity. Similar results have been reported (Kharazi *et al*., 2022) in poultry and non-ruminants (Aritonang *et al*., 2025; Li *et al*., 2022).

The application of BaLe in current research also appears to stimulate metabolism positively. Plasma metabolites of chickens from all BaLE supplementation groups (Table 4) were significantly better (P<0.05) compared to those without BaLE supplementation (BaLE-0). Increased protein synthesis was indicated by significantly higher levels of total protein and albumin (P<0.05) in the BaLE-2 treatment group, at 7.85 and 6.28 g/dL, respectively.

The effect of BaLE on health and metabolism, such as assessing total protein, albumin, globulin, glucose, and triglyceride levels, offers insight into the metabolic and immunological responses triggered by plant extracts. The decrease in TAG and plasma cholesterol levels likely results from inhibited lipid metabolism. This is further supported by the increase in NEFA levels, indicating that BaLE-2 administration either reduces TAG formation from fatty acids or increases beta-oxidation, thereby increasing plasma NEFA levels. Additionally, the reduction in plasma cholesterol can be linked to decreased sterol transport. Previous research has clearly shown that natural extracts can effectively decrease lipid transport activity (Aritonang *et al*., 2025). This result may be an essential factor in reducing abdominal fat accumulation.

Additionally, monitoring markers such as aspartate transaminase and alanine transaminase will indicate the impact on liver function and overall metabolic homeostasis and are directly related to increased plasma albumin and total protein (Adeyeye, 2020). Furthermore, with careful analysis, the plasma globulin and albumin/globulin ratios can determine the immune status and protein synthesis efficiency in chickens, and even all types of animal (Abdelli *et al*., 2021). This shows that the phytochemicals in BaLE can modulate overall metabolism.

The absorption of glucose into cells also increased, as did the rate of glycolysis, as indicated by increased levels of glucose-6-phosphate and pyruvate. A good indication is also seen in the decrease in fat deposit formation. This result is marked by a decline in TAG formation with BaLE administration, which was lowest (P<0.05) in the BaLE-2 treatment group. This result also proves that the regulation of catabolism and anabolism related to energy regulation can be modulated by phytochemicals. Research results (Dudi *et al*., 2023), for example, show that AMPK expression, which helps regulate energy homeostasis, increases with flavonoid administration, as do lipid regulator genes (Flees *et al*., 2020).

The modulation of bioactive compounds from Burahol towards an increase in the rate of anabolism, particularly in skeletal muscle tissue, was evident in the increased expression of proteins related to growth signalling. Table 5 shows an increase in insulin hormone activity, which was highest (P<0.05) in the BaLE-2 treatment group (6.33) compared to the broiler group without treatment and other treatment levels. The increase in insulin was driven by a simultaneous rise in GHR (P < 0.05) in the same experimental group. The increased expression of specific proteins, ranging from IGF-1 to IGF-5, also demonstrated the same phenomenon.

Table 5: Average concentrations of growth markers in the plasma of broilers at various BaLE levels.

Growth marker (ng/dL)	Treatment groups			
	BaLE-0	BaLE-1	BaLE-2	BaLE-3
GHR	2.53[a]	2.85[a]	4.65[c]	4.02[c]
Insulin-like GF-1	1.96[a]	2.98[b]	4.42[c]	3.95[d]
Insulin-like GF-2	1.94[a]	3.69[b]	4.19[c]	3.83[d]
GFBP-1 Insulin	1.86[a]	3.18[b]	4.05[c]	3.85[d]
Insulin GFBP-4	2.25[a]	2.70[a]	3.81[c]	2.84[c]
Insulin GFBP-5	1.19[a]	1.91[b]	3.09[c]	2.88[d]
Insulin	4.09[a]	4.82[b]	6.33[c]	5.98[d]

GHR: growth hormone receptor; Insulin-like GF: insulin-like growth factor; Insulin GFBP: insulin-like growth factor binding protein; [a,b]Average growth marker levels with different superscript letters on the same row indicate significant differences (P<0.05).

The detailed mechanism of how phytochemicals interact with insulin, its receptors, and IGF has not been extensively reported. However, regarding the exact action of how BaLE functions, a published report (Olabode *et al*., 2025) states that phytochemicals may influence insulin signaling by affecting receptor sensitivity or phosphorylation cascades. Other researchers have indicated that the increase in insulin, IGF, and IGFBP following phytochemical administration requires further research to clarify its role in glucose regulation and overall nutrient distribution, as well as its connection with the mTOR gene in promoting higher growth, as confirmed by current studies (Figures 1 and 2). Previous research has demonstrated that height growth can be regulated by mTOR through signaling triggered by increased levels of IGF and IGFBP (Urban *et al*., 2024; Mushawwir *et al*., 2025).

Performance

The effect of BaLE administration on feed utilisation efficiency in broilers during the study is shown in Table 6.

Table 6: Effect of BaLE on DMD, OMD, nitrogen retention, CDP, and ME of broilers.

BaLE level	DMD (%)	OMD (%)	Nitrogen retention (%)	CPD (%)	ME (kcal/kg)
BaLE-0	45.11[a]	55.92[a]	63.70[a]	61.78[a]	2452[a]
BaLE-1	67.90[b]	70.87[b]	73.55[b]	72.76[b]	2582[b]
BaLE-2	70.95[c]	75.67[c]	77.60[c]	75.71[c]	2645[c]
BaLE-3	66.31[b]	67.61[d]	72.29[b]	66.46[d]	2633[c]

Different letters on the same row indicate significant differences (P<0.05). DMD: dry matter digestibility; OMD: organic matter digestibility; CPD: crude protein digestibility; ME: metabolisable energy.

Nutrient utilization. The efficiency of the chickens fed 100 mg/kg of feed (BaLE-2) appeared to be the highest (Table 6). However, overall BaLE supplementation improved feed utilisation efficiency (P<0.05) in all BaLE supplementation levels compared to the experimental broiler group without BaLE supplementation (BaLE-0).

Previous research results have suggested that the presence of various phytochemical compounds, such as flavonoids and phenolic acids, as those contained in BaLE, is hypothesised to improve nutrient digestibility by modulating non-pathogenic microbiota in the intestine and improving intestinal morphology (Mushawwir *et al.*, 2023; Nurfauziah *et al.*, 2024), which ultimately increases absorption efficiency. The reported research results (Obianwuna *et al.*, 2024) show an increase in the volume and size of ileal villi, thereby increasing the potential for nutrient absorption.

These compounds can also stimulate digestive enzyme secretion and reduce oxidative stress in the intestinal lining (Mushawwir *et al.*, 2025), further optimising nutrient absorption (Manin *et al.*, 2024). This mechanism is crucial, as improved feed utilisation directly correlates with enhanced growth performance and feed conversion ratio in broiler chickens, providing economic benefits for poultry production. This improvement is consistent with findings from studies on other phytogenic feed additives, which have demonstrated similar increases in nutrient utilisation in broiler chickens (Purwanti *et al.*, 2024; Urban *et al.*, 2024).

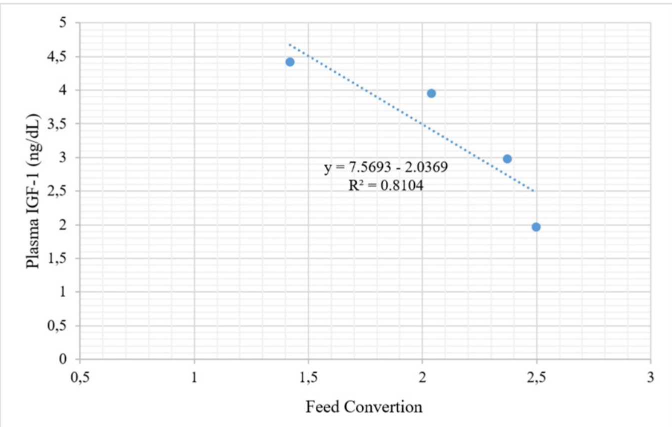

Figure 1: Regression model of the relationship between plasma IGF-1 concentration and broiler feed conversion at 35 days of age.

As an implementation of increased nutrient utilisation efficiency, chemical modulation by specific proteins also increases, as shown in Table 4. Improvements in overall metabolic quality and rate lead to increased feed conversion for growth (Figures 1 and 2). The relationship between IGF-1, which plays a role in skeletal muscle growth, strongly correlates with concentration and feed conversion ratio (Figure 1).

Figure 1 shows that an increase in IGF-1 concentration contributes 81.04% to improving feed conversion to body weight, or reduces the ratio between feed intake and weight gain, as shown in Figure 2. The regression model y = 7.5693 - 2.0369x, as shown in Figure 1, indicates that an increase in IGF-1 activity of 1 ng/dL causes a decrease in feed conversion value of 2.03, or feed conversion to body weight increases by 2.03 units.

This relationship indicates that increased expression of the specific protein, IGF-1, can enhance growth modulation and metabolic efficiency, particularly feed conversion into body tissue (see also Figure 2).

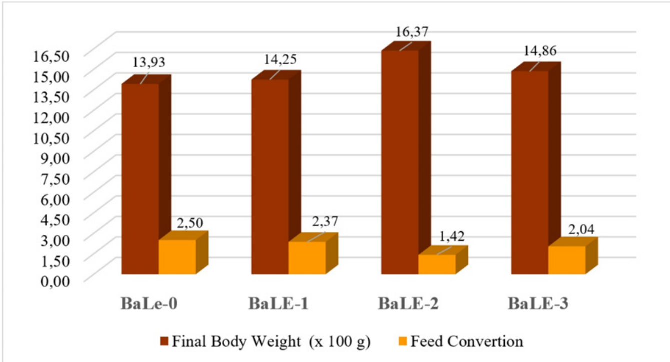

Figure 2: Final body weight (at 5 weeks of age) and feed conversion with BaLE supplementation.

The final body weight ultimately demonstrates high feed efficiency and conversion. BaLE's role as a metabolic stimulator is evident in its high effectiveness at a dosage level of 100 mg/kg feed, with an average final body weight of 1637 g.

Specifically, phytogenic additives have been shown to improve feed conversion ratios in broiler chickens through various mechanisms, including improved nutrient absorption and digestion (Zhao *et al.*, 2023). Additionally, improved protein utilisation, characterised by increased nitrogen retention, enhances the availability of amino acids in muscle protein synthesis (Nurfauziah *et al.*, 2024). Overall, the current research results presented in Figures 1 and 2 provide an understanding of how BaLE affects the expression of genes related to nutrient transporters, digetive enzymes, and proteins associated with muscle tissue formation, although this study does not report in specific on nutrient transport and digestive enzymes. but the current research results are supported by previous research results showing that natural extracts containing flavonoids can increase nutrient transport (Tanuwiria *et al.*, 2022; Meligy *et al.*, 2023; Mushawwir *et al.*, 2023) and digestive enzymes (Obianwuna *et al.*, 2024) and improve gut ecology and microbiota (Li *et al.*, 2022; Manin *et al.*, 2024), as well as provide a deeper understanding of its systemic impact on broiler physiology (Flees *et al.*, 2020;

Kuka *et al*., 2023).

CONCLUSION

Adding BaLE to the diet can promote overall metabolic enhancement, potentially due to its phytochemical properties and high antioxidant capacity. This addition also accelerates weight gain and improves feed efficiency. In particular, this study's results indicate that a 100 mg/kg feeding level in broiler rations (BaLE-2) shows the most optimal results and is highly recommended for application. Nevertheless, these results provide highly accurate information that can serve as a basis for future research planning. The specific mechanisms underlying BaLE administration's modulation of immune signalling and growth, particularly its effects on growth genes, remain an important area of future research.

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NOVELTY STATEMENT

The use of Burahol leaves as a feed additive for livestock has never been documented, particularly in extract form. The phytochemical potential of Burahol leaves was examined through precise in vitro analysis to accurately evaluate its benefits. Previous studies only reported the concentrations of phytochemicals present, whereas this research presented in vivo experimental results in broilers. This study can provide new insights into the positive effects for broilers and the potential of this plant as a superior feed additive.

AUTHORS' CONTRIBUTION

The authors listed in this article have made equal contributions, from preparing the research proposal, planning and designing the study, conducting scientific discussions to enhance the quality of the research, and writing this article.

Ethical approval

The Animal Ethics Committee of the Research Licence Management Directorate, Indonesia, has investigated the preparation and implementation of this research and has decided that it is feasible based on the principles of animal welfare and research ethics, with decision number No. 462/KEP.04/SK/01/2025.

Generative AI and AI-assisted technology statement

The authors explicitly state that the writing of this article did not use any AI tools or technology, whether in composing sentences, creating images, or any other means to support the creation of this article.

Conflict of interest

All authors solemnly declare that we have no conflict of interest with any party regarding the data, funding, and all aspects that constitute the output of this research.

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