Physical Education, Health and Social Sciences

https://journal-of-social-education.org

E-ISSN: 2958-5996

P-ISSN: 2958-5988

The Dose Effect Relationships of a Commercial Herbitol Compound on Feed Conversion, Carcass Traits and Economic Stability of Broiler Chickens

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DOI: https://doi.org/10.63163/jpehss.v4i1.1096

Abstract

A six-week research was conducted in order to regulate the impact of various stages of commercial phytogenic feed supplement, herbitol, on growing response, carcass value, and economic performance of broiler chickens. Cobb-500 chicks were then randomly selected and at the age of a hundred and eighty days in four treatments, which consisted of Control (no Herbitol), Group-A (2mL/L), Group-B (4mL/L) and Group-C (6mL/L) of Herbitol in drinking water. Three replicates were used in each group in the completely randomized design, and under the same management and vaccination guidelines, birds were reared. Growth performance data was gathered weekly and on the day of 42, samples of breast meat were subjected to standard AOAC (Association of Official Analytical Chemists) tests. ANOVA was used to perform the statistical analysis. The results obtained demonstrated that birds in Group A (2 mL/L Herbitol) recorded a notable ($P<0.05$) higher performance on various parameters. The final alive body mass (2210.4g) of this population was the highest, the water and feed consumption was greater, and feed ratio (1.82). There was also an improvement in the quality of the carcass as reflected in the high contents of moisture (64.91%), crude protein (19.71%), fat (2.40%), and ash (1.26) in the breast meat. Group A was the most economical in terms of net profit per bird (Rs.23.52) and lowest mortality rate (3%). Conversely, Group C (6mL/L) birds had poorer performance, increased mortality and financial loss, which means that there is possible metabolic pressure at high doses. All in all, Herbitol supplementation of 2 mL/L was effective in enhancing broilers growth, meat composition, survivability and profitability. The results also emphasize that dosage optimization of phytogenic additives should necessarily be applied to achieve optimal biological efficiency and economy in the production of poultry.

Key Words: Growth performance, Poultry, carcass, FCR.

Introduction

Poultry business is a significant foundation of high value animal protein; this is why it is an important producer of food security in the world. The industry creates both direct and indirect jobs to around 1 to 1.5 million people in Pakistan and the projected 28 percent of the total meat production within the country (GoP, 2015). Despite the fact that the poultry sector has remained to expand, there have been monumental challenges that entail feed efficiency and meat quality and

consumer safety particularly due to usage of antibiotic and growth promoters. Previously, Anibiotic Growth Promotors (AGPs) have been incorporated in the poultry feed to enhance growth performance and feed ratio (FCR). However, the unregulated and widespread use of antibiotics and growth promoters has led to the problem of antimicrobial resistance (AMR), which is a dangerous risk to human health and resulted in regulatory restrictions and bans in the majority of countries (Chattopadhyay, 2014; Landers et al., 2012). This has given rise to the growing tendency to other forms of growth, e.g. phytogenic feed additives (PFAs) to enhance growth performance and meat worth without the side-effects of antibiotics etc.

Phytogenic feed additives have a variety of beneficial qualities, such as antimicrobial, antioxidant, anti-inflammatory and immune-modulatory effects. It has also been reported that these supplements enhance the health of the gut, enhance the digestibility of the nutrients, and also have beneficial effects on the overall performance of broilers chicken (Windisch et al., 2008; Aminullah et al., 2025). Different studies have highlighted the PFAs as potential alternatives to the growth promoters in poultry production AGPs and the PFAs have also been identified to increase the growth performance and meat quality (Aminullah et al., 2025).

Some of the herbs such as garlic (Allium sativum), ginger (Zingiber officinale) and clove (Syzygium aromaticum have been found very effective as to improving digestibility of nutrients and immune response but simultaneously reduce lipid peroxidation in muscle tissues (Cristo et al., 2022). Additionally, Khattak et al. (2013) has discovered that broilers that were fed herbal mixture (basil, caraway, laurel, lemon, oregano, sage, tea, thyme) were found to have significant ($p<0.05$) difference between BW, weight gain and feed intake as compared to the control group. There was no discernible difference in the blood biochemical levels between the treatment and control groups. Equally, there are prospects of significant potential in the use of the dietary supplements of neem leaf powder (NLP) and garlic as natural substitutes to antibiotic growth promoters in broiler growth. Due to their synergistic bioactive effects, these additives increase feed efficiency, growth, and meat quality without causing the negative effects that synthetic compounds cause (Orlowski et al., 2018; Roy et al., 2023). Research has reported that there was great improvement in feed to body weight gain and feed to body weight gain in broilers that were fed on these herbal additives. On this note, commercial phytogenic blends like Herbitol were developed to increase the synergistic effects and enhance the poultry performance. Feed ratio is a very important issue in poultry farming that has affected the economic performance and environmental sustainability. According to Iqbal et al. (2016), broilers fed with Herbitol at the dosages of 2, 4, and 6 mL/L began to drink more water and showed better ratios of feed to weight than the control group of birds because of the potentially increased digestive activity and nutrient uptake caused by the active ingredients of the substance.

The broiler meat chemical composition which consists of parameters and protein, fat, moisture content and mineral composition is crucial in consumer recognition and dietary cost. Phytogenic additives have been cited to have an effect on these parameters certainly. A research by Aminullah et al. (2025) noted that the components of herbal feed must increase meat satisfactory characteristics of broiler chicken along with reduced lipid oxidation and improved antioxidant pastime. These effects contribute to the increase in meat shelf life and dietary profile. Besides, addition of Herbitol into the broiler diets has also been linked to changes in the composition of the meat. Iqbal et al. (2016) noted that herbitol-enriched broilers showed changes in blood composition, which would be similar to the underlying metabolic and physiological changes that resulted in high excellence in meat. What these results highlight is the fact that Herbitol as a

nutritional supplement has the ability to enhance the aesthetics of broiler meat as well as the chemical composition of feed.

However, scientific literature concerning the specific effects of varying concentrations of Herbitol on broiler overall performance and meat chemical composition remains confined, in particular underneath subtropical conditions. Therefore, Herbitol, a business herbal product composed of ginger, garlic, vinegar, clove oil, safrol, belladonna, dextrose, and mineral salts, so the existing observe is designed to evaluate the impact of various concentrations of an industrial Herbitol compound on feed intake and feed conversion ratio (FCR) in broiler chickens.

Materials and Methods

Duration of study & location

The present study was conducted in a rural poultry farm of the Livestock and Dairy Development Department, Quetta and over a six-week span during October 2025 to November 2025. The experiment was conducted to establish the effects of different doses of dietary consumption of a commercial Herbitol molecule on feed intake, growth and meat content of broiler chickens.

Housing and Experimental Birds

A native hatchery delivered 180 day-old Cobb-500 broiler chicks. A deep litter system with typical husbandry conditions was used to house birds that were received at random. Formalin and potassium permanganate disinfectant (40 mL and 20 g per 100 cubic feet, respectively) were used to sterilize the poultry shed before the birds were placed there. After being applied to the walls and the floor, the lime (calcium oxide) was allowed to dry for a full day.

The litter material was taken (rice husk) in one of the local rice mills and sun-dried (12 hours) to remove the microbial load, and then used to a depth of 2-4 inches. The temperature and humidity were kept within an environmental condition as per brooding standards. Table 1 elaborates the brooding plan.

Table 1: Schedule of Brooding Temperature

Week(s)	Temperature in °F
First	90 to 95
Second	85
Third	80
Forth	75
Fifth	70

Adequate lighting and ventilation were ensured throughout the trial. Birds were managed under a 24-hour light schedule and monitored for health and welfare daily. Mortality, if any, was recorded.

Vaccination Protocol

Birds were vaccinated against communal viral diseases following the schedule outlined in Table 2.

Table 2. Vaccination Schedule

Day	Vaccine	Administration route
Day-3	NDV + IB	Ocular dropping
Day-10	IBD	Through drinking water
Day-22	NDV	Through drinking water
Day-28	IBD	Through drinking water

Where; NDV: Newcastle Disease virus; IB: Infectious Bronchitis; IBD: Infectious Bursal Disease

Experimental Design

The completely randomized design (CRD) used to assign the birds to four treatment groups was totally randomized: group-A, group-B, group-C and group-D. Each group had 45 birds which were divided into three duplicates of 15 birds.

Group A: Control (no Herbitol)
Group B: Herbitol at 2 mL/L of drinking water
Group C: Herbitol at 4 mL/L of drinking water
Group D: Herbitol at 6 mL/L of drinking water

Table 3. Treatment Plan of Herbitol usage with different doses

Groups	Treatment details	Herbitol dose (mL/ liter in water
Group-A	Control	No Herbitol
Group-B	Herbitol low dose	02 mL
Group-C	Herbitol medium dose	04 mL
Group-D	Herbitol high dose	06 mL

Herbitol Composition

The commercial Herbitol compound (sourced from J.R. Herbal Pharmacy, Karachi) contains a blend of dextrose, garlic (Allium sativum), ginger (Zingiber officinale), clove oil (Syzygium aromaticum), vinegar, safrol, belladonna, and essential salts etc.

Physiological & Nutritional Parameters for Performance Evaluation

The birds' live body weight, feed and water consumption, and feed conversion ratio (FCR) were measured in order to assess how they responded to Herbitol supplementation.

Each of the treatment groups was performed on a weekly basis by randomly selecting eight birds, which were identified and weighed on an electronic balance with an error as small as possible, i.e. 1 g. This was to ensure that the health patterns of growth and body weight development throughout the period of the experiment was monitored. The amount of feed was supplied twice a day, in the morning and the evening. The amount of feed fed to each bird on a daily basis was determined using the formula:

$$\text{Intake (feed) in gram/ bird/ day} = \frac{\text{Total feed offered} - \text{feed refused}}{\text{Total number of birds}}$$

For water intake, clean drinking water was provided ad libitum. The amount of water was charted and calculated on a daily basis based on the following formula:

$$\text{Intake (water) in mL/ bird/ day)} = \frac{\text{Total water offered} - \text{Water refused}}{\text{Total Number of Birds}}$$

Feed efficiency was determined by determining Feed Conversion Ratio (FCR) on a weekly basis. It was determined by dividing the total feed intake (g) by the body weight gain (g) of each bird:

$$\text{FCR} = \frac{\text{Total feed intake (gm)}}{\text{Body weight gain (gm)}}$$

Chemical Parameters for Performance Evaluation

At the time of completion of experimental length (42 days), eight (08) poultry birds per group were selected randomly, slaughtered, and the piece of breast meat as a sample were collected for proximate analysis. The following parameters were determined according to AOAC (2000) protocols such as percentages of moisture contents, crude protein, fat and Ash contents.

Moisture content in the broiler meat samples was determined by drying the samples in a hot air oven at 105°C for 2 hours, followed by cooling in a desiccator to ensure the prevention of moisture absorption. After cooling, the weight of the dried sample was measured. The moisture content was calculated using the formula,

$$\text{Moisture (\%)} = \frac{W_2 - W_3}{W_2 - W_1} \times 100$$

Where W1 represents the weight of the empty dish, W2 is the weight of the sample plus the dish, and W3is the weight of the dried sample plus the dish.

Crude protein content was quantified using the Kjeldahl method. A sample of meat (2 g) was digested with a mixture of sulfuric acid and catalyst (copper sulfate and sodium sulfate), followed by distillation of ammonia in the presence of sodium hydroxide. The ammonia trapped in boric acid was titrated with HCL (0.1 N). The N^+ content was then calculated through the standard formula,

$$\text{Nitrogen (\%)} = \frac{1.4\,(V_1 - V_2) \times N \times 250}{\text{Sample weight (g)} \times \text{volume of diluted sample (mL)}}$$

Where, V1and V2represent the titration values of the sample and blank, respectively, and N is the normality of the titrant (HCl). The protein percentage was determined by multiplying the nitrogen percentage by a conversion factor of 6.25.

The Soxhlet extraction method was used to determine the fat content. For six hours, a two-gram sample of meat was extracted using ether in a fat-free extraction thimble. Following the extraction, the formula was used to determine the fat percentage.

$$\text{Fat (\%)} = \frac{W_2 - W_1}{W_3} \times 100$$

Where, W1is the weight of the empty flask, W2is the weight of the flask plus the extracted fat, and W3is the weight of the meat sample.

Ash was ascertained by subjecting a 5g sample of meat to incineration in a muffle furnace under the temperature of 550 o C at a period of 5 hours. The sample was weighed after incineration in a desiccator. The following formula was used to calculate the ash content,

$$\text{Ash (\%)} = \frac{\text{Weight of Ash}}{\text{Weight of sample}} \times 100$$

Mortality Rate

The entire experimental birds were checked daily for mortality, and the recorded mortality rate was calculated using the following formula such as

$$\text{Mortality (\%)} = \frac{\text{Number of birds died}}{\text{Total birds reared}} \times 100$$

Economic Analysis

Income was based on market sale price, and expenditure included cost of chicks, feed, Herbitol, vaccines, and labor. Economic efficiency was assessed based on net return per bird using the formula as;

Net return = Income - Expenditure

Statistical Analysis

Complete randomized design (CRD) and one-way analysis of variance (ANOVA) were used to analyze the data. At the P = 0.05 threshold of significance, the means of the treatments were compared. JMP software (Version 8.1; SAS Institute Inc., Cary, NC, USA) was used to perform the statistical analysis. The results were presented in mean SD format

Results & Discussion

In an experiment lasting six weeks, researchers compared the differences in Herbitol levels on broilers on the performance of growth, feed and water consumption, mortality, carcass structure and economic efficiency. There was statistical significance ($P<0.05$) in the feed consumption, live body weight, feed to weight ratio and meat composition between the treatment groups. The Herbitol supplementation at the concentration of 2 milliliters per liter of drinking water has been observed to be better in feed consumption and various live body weight, feed ratio (FCR), mortality rate, and quality of meat.

Growth Performance and Physiological Parameters

Feed Intake

The cumulative feed consumption showed significant difference ($P<0.05$) between treatment groups in the 6 weeks period of experiment (Figure 1). The most consumed feed was Group B (Herbitol @2 mL/L) broilers with best average feed consumption per bird being 4034.88 g/bird and Group-D who consumed the lowest feed (3914.64 g/bird). Analysis of the variance (ANOVA) indicated that there were significant differences between the groups. Groups-B and C recorded the highest feed intake whereas Group-A and Group-D had less feed intake. Studies showed that Herbitol at a ratio of 2 milliliters per liter of water gave the best results in the regulation of optimum feed consumption levels in broilers. In a study conducted by Khattak et al., (2014) they found that the feed intake was higher when an Herbal mixture was added to broilers ration. These results are supported by Oleforuh et al. (2014). This study showed that broilers fed with Herbitol consumed more as compared to the controls. Such findings are similar to those of the researches of Kairalla et al. It was found in the study by Kairalla et al. (2022) that the feeding of broilers made with ginger and garlic diets showed non-poor feeding and growth. Both ginger and garlic have bioactive chemicals that help to boost the digestive efficiency and also initiate more hunger which results to more consumption of the feed. This probably contributed to increased feed consumption due to the concomitant effect of these herbs.

Several studies have reported that the consumption of broiler feed can be increased substantially by the addition of a supplement that has a mix of ginger and garlic extracts known as Herbitol. Irekhore et al. (2020) have observed that a broiler diet supplemented with either 5g/kg of garlic or ginger powder or 2.5g/kg of the two mixtures has led to an increase in feed intake as compared to the control group. This is probably because of the biologically active compounds found in garlic that include diallyl disulfide, allicin, glucasides, allium and other sulfur containing compounds which has been proven to increase digestion and appetite. These compounds have the potential to

enhance the absorption of nutrients and optimiza the total feed consumed through maintenance of a healthy gut microbiome and enhance digestion. On the same note, ginger is an excellent source of bioactive compounds such as shogaol and gingerol, which have anti-inflammatory and antioxidant effects that may help to increase feed consumption and intestinal health (El-Sabrout et al., 2023; Elagib et al., 2013).

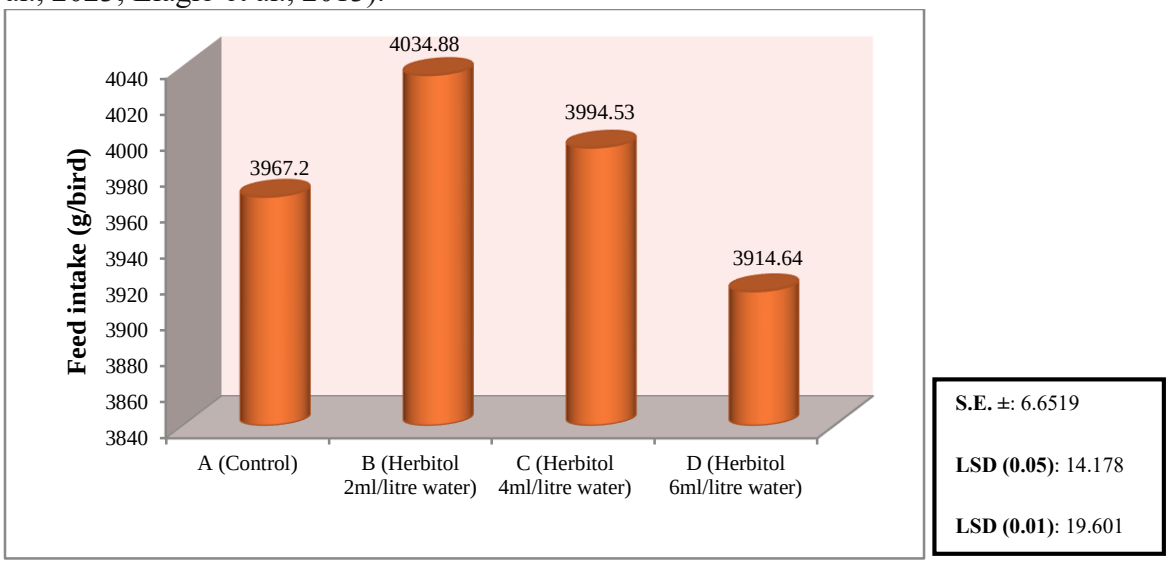

Figure 1: The effects of Herbitol concentration on the feed intake (g/bird) of broiler chickens

Water Intake

Nonetheless, Figures (2) showed that, appreciable ($P<0.05$) differences existed in the use of water in the two groups. Group B had the greatest fluid intake (8,748.83 mL/bird), followed by Groups A (8,246.61 mL/bird), C (8,494.01 mL /bird), and D (8,006.42 mL/bird). These findings may indicate a dose-related trend reduction in water consumption in relation to Herbitol supplementation. The improved water intake at moderate doses (2 to 4 mL/L) may be due to enhanced palatability and physiological stimulation by garlic and ginger extracts. However, the decline in Group D suggests that higher concentrations may reduce intake, possibly due to reduced palatability or stress-related effects. Similar trends have been reported by Bahadori et al., (2013).

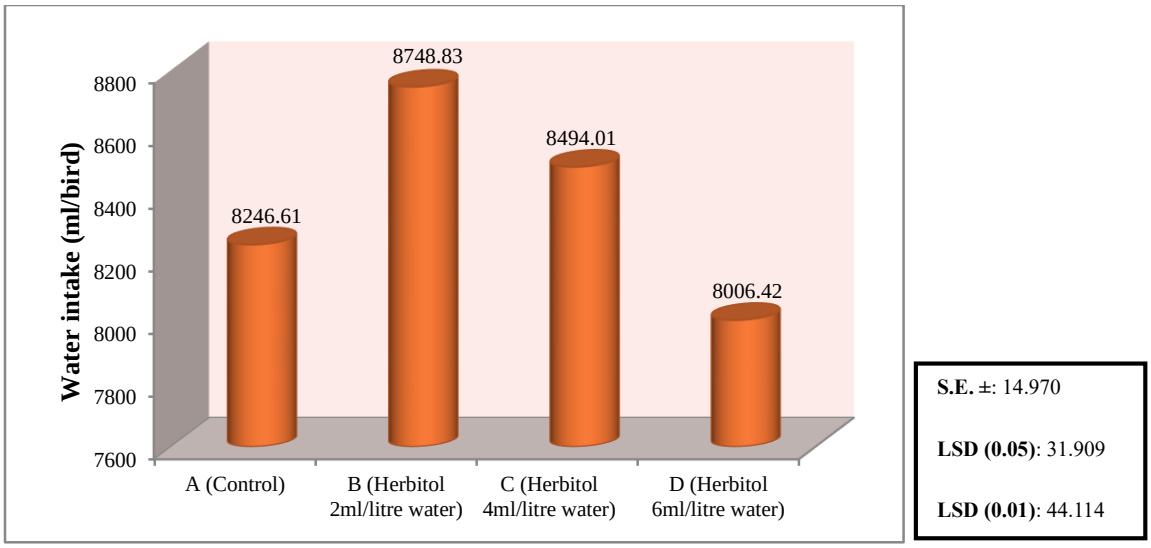

Figure 2: Impact of the Herbitol supplementation on water consumption (mL/bird) of broilers

Live Body Weight

The treatment of Herbitol significantly ($P<0.05$) affected the final live body weight (Figure 3). group-B recorded the highest mean body weight (2210.44 gram/ bird), group-C (2124.18 gram/ bird), group-A (2062.31 gram/ bird), and group-D (2002.24 gram/ bird). ANOVA confirmed that there were significant differences between all groups. Groups of broilers fed on Herbitol had higher live body weight than the control group. This aligns with findings by Salem et al. (2023), who showed that herbal extracts like garlic and ginger had a beneficial effect on poultry growth performance. The improved feed consumption and nutrient absorption facilitated by the active compounds in the herbal supplement may be responsible for the increase in body weight. It has been proved that supplementation of Herbitol (mixture of ginger and garlic extracts) through feed broilers fed have significantly increased the live body weight as compared to the control birds. Findings from a number of researchers also support these results as beneficial effects of ginger and garlic on poultry growth performance has been reported. For example, supplementation of broilers' diets with garlic and ginger commercial powder was found to enhance feed efficiency, quality of chicken meat and carcass pattern, and cost-effectiveness (Irekhore et al., 2020; El-Sabrout et al., 2023).

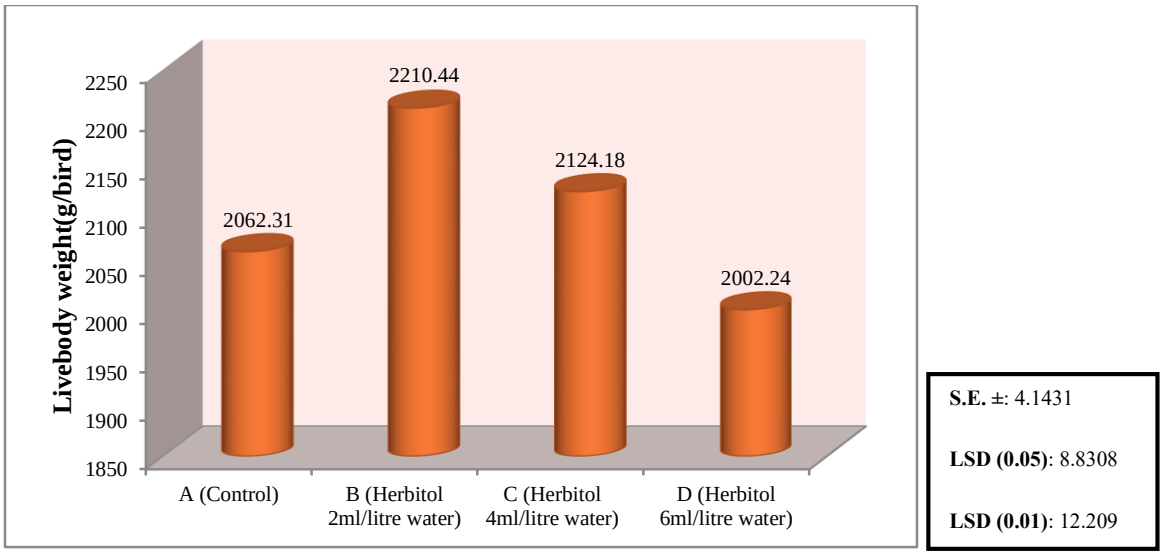

Figure 1: Impact of Herbitol supplementation on live body weight (g/bird) in broiler chickens

Feed Conversion Ratio (FCR)

FCR Herbitol supplement significantly ($P<0.05$) influenced FCR levels (Figure 4). Lowest FCR (1.95) values were observed in group D that indicate a negative effect at maximum Herbitol concentration followed by group B with FCR efficiency of 1.82 than group A (1.84) and group C (1.88). Improved feed efficiency was also indicated by the marked decrease in the FCR observed in the Herbitol-treated groups. The results of Omar et al. (2016), exhibited enhanced FCR in broilers when fed with herbal extracts are justified by this finding. The FCR of the Herbitol supplementation was better, indicating increased nutrient utilization and absorption and hence better growth performance. Additionally, Zhang et al. (2023) reported that including oregano aqueous extract in the diet of broilers resulted in a significant increase in average daily gain, body weight and FCR. The increase in FCR indicates that inclusion of Herbitol improves nutrient utilization and absorption, which translates in an improvement in growth performance. The bioactive compounds present in garlic and ginger in the form of allicin and gingerol might stimulate the enzyme activity and promote intestinal health, and also enhance the nutrient digestion and absorption.

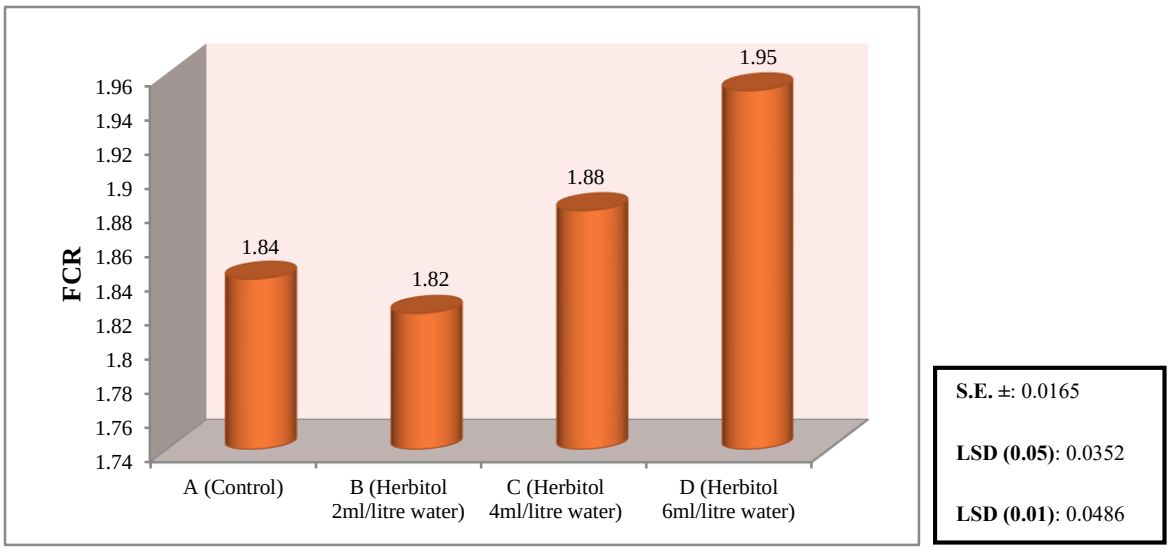

Figure 2: Effect of Herbitol on FCR in broilers

Chemical parameters for growth performance

There was significant difference in chemical composition of broiler meat among treatment ($P<0.05$). The highest reaction was again noted in group D in the abovementioned measures and all these measures seemed to be dose dependent on the basis of proximate analysis. These values were significantly higher than in the other groups and it suggests that nutritive value of broiler meat is enhanced by Herbitol mild supplementation. The same findings have been gained when herbal supplements are added in the chicken diets. The test of feeding chickens with an Herbal feed additive (in the diets) also positively affected and changed the chemical content of the breast muscles and the resultant higher values of fat and protein (Lipiinski et al., 2019).

According to Puvaca et al. (2014), and for the chicken supplemented with 2 gram/ 100 gram garlic powder in their feed, protein content increased in breast meat (22.9 gram/100 gram) in contrast to the control group (21.8 gram/100 gram). Nevertheless, the lowest protein (17.15%) and fat (1.90%) contents were recorded in Group D with the highest Herbitol level (6 mL/L) indicating that excessive level of sheep dropwort supplementation may have a negative effect on nutrient composition probably due to metabolic or digestive stress. This result highlights the necessity to modulate the additive concentrations to obtain the highest quality degree meat. Experiments investigating the influence of herbal additives on the quality of the broiler meat have demonstrated obtained similar results.

As an example, the study by Atay (2023) revealed a positive impact of adding medicinal plants to broiler feed on meat quality indicators (protein levels) but excess consumption did not have any other benefits. The level of ash which was a measure of the mineral make-up was also greatest in Group B (1.26%) and lowest in Group A (1.03%) with a lot of differences being observed between Group B and Group C and D. Yet, the distinction in Group B and the control was not statistically significant. These results indicate that Herbitol supplementation of 2 mL/L provides the best way to improve the nutritional values of broiler meat, whereas the supplements over 2 mL/L probably undermine the nutrient composition, probably through metabolic or digestive stress (table 4).

Table 4: Proximate Composition of Broiler Breast Meat Effect of Herbitol Supplementation (Mean ± SE)

Parameter	Group A(Control)	Group B (2 mL/L)	Group C (4 mL/L)	Group D (6 mL/L)	S.E. ±	LSD 0.05	LSD 0.01	Significance
Moisture (%)	64.26 ± 0.70^{ab}	64.91 ± 0.70^{a}	62.72 ± 0.70^{c}	60.73 ± 0.70^{d}	0.7016	1.7167	1.9986	$P < 0.05$
Protein (%)	18.85 ± 0.61^{ab}	19.71 ± 0.61^{a}	18.14 ± 0.61^{bc}	17.15 ± 0.61^{c}	0.6051	1.4806	2.1186	$P < 0.05$
Fat (%)	2.10 ± 0.15^{ab}	2.40 ± 0.15^{a}	2.04 ± 0.15^{bc}	1.90 ± 0.15^{c}	0.1536	0.3758	1.8846	$P < 0.05$
Ash (%)	1.03 ± 0.11^{ac}	1.26 ± 0.11^{a}	1.10 ± 0.11^{c}	1.16 ± 0.11^{bc}	0.1114	0.2727	1.4476	$P < 0.05$

The presence of statistically significant differences between groups ($P < 0.05$) is denoted by superscripts with different letters (a, b, c, and d) in the same line

Mortality

The mortality rates were different in the treatment groups and depended on the degree of Herbitol supplementation. The control group (Group A) was the most exposed to the highest rate of mortality as it was not given Herbitol. On the contrary, the lowest death rate was observed in Group B and Group C where birds were fed with Herbitol 2 mL/L and 4 mL/L respectively. The group D (Herbitol @6 mL/L) showed intermediate level of mortality. Table 5 showed worst representations and best representations where different Herbitol doses, and their effect on birds were illustrated. These findings indicate that Herbitol could potentially enhance the health and survival of broiler, particularly when administered at 2-4 mL/ lit. The mortality outcomes indicate that supplementing of broilers with Herbitol, in particular at moderate levels, could enhance their health and liveability. Herbitol's antibacterial and immune-boosting qualities may be capable for the drop in passing rates by expanding infection resistance. Carvacrol, cinnamon aldehyde, and capsicum oleoresin are cases of phytogenic nourish added substances that have been appeared to influence broiler chickens' immunological reactions. Pirgozliev et al. (2019), for occasion, found that broilers given a combination of these phytochemicals communicated more immunological biomarkers, counting IL-2, IL-18, IL-10, and IL-17C, demonstrating superior safe work (Pirgozliev et al., 2019; Abdelli et al., 2021).

Table 5. Impact of varying Herbitol concentrations on broiler mortality (%)

Treatment Group	Herbitol Dose (mL/L)	Mortality Rate (%)
Group A (Control)	0	8 %
Group B	2	3 %
Group C	4	3 %
Group D	6	6 %

Economic Performance

The economic feasibility of incorporating Herbitol to broiler generation at various dosage was polled. The evaluation covered all the important inputs costs that include labor, bedding equipment, drugs, Herbitol, chicks and miscellaneous expenses. The determination of income was made using the end of the current showcase rates live body weight of broilers. The net benefit of any individual bird was determined by subtracting it adding up costs of the bird against its corresponding salary**.**

The results showed that the performance of the birds as well as the production costs of the same contributed to economic returns. It is worth noting that adding Herbitol affected the economics of production where variations in profitability of the treatment group, the cost of feeds and overall costs of inputs came into the limelight. It was discovered that supplementation did not yield returns with high levels and this study concluded that moderate levels of supplementation yielded higher returns and reduced costs. These findings show that in order to achieve maximum economic efficiency of broiler production systems the amounts of additives should be optimized. Table 6 gives details of the economic effects of different concentrations of Herbitol on broilers. The groups that had used Herbitol supplements were more economically profitable compared to the control group. This is in line with earlier studies by Sethar et al. (2016) who revealed that supplementation of broilers with herbal extracts is capable of enhancing production and economic performance. Some of the general economic advantages of Herbitol are improved growth performance, improved feed economy and reduced mortality rate. Also, Rafeeq et al. (2017) tested herbal feed additives as possible alternatives to antibiotics to produce broilers. Their study revealed that these herbs have the potential to enhance growth performance and feed ratio in broiler production, and enhance productivity and profitability. The economic results of the study point out the significance of maximizing feed supplements to maximize the output and cost-effectiveness of broilers.

Table 6. Economic implications of different concentrations of Herbitol on broilers (per). bird foundation)

Particulars	Group A (Control)	Group B (2 mL/L)	Group C (4 mL/L)	Group D (6 mL/L)
Day-old chicks (Rs.)	27	27	27	27
Feed consumed (kg)	3.97	4.03	3.99	3.91
Feed rate (Rs./kg)	40	40	40	40
Feed cost (Rs.)	158.80	161.20	159.60	156.40
Herbitol cost (Rs.)	0.00	10	15	20
Medication (Rs.)	8	8	8	8
Litter cost (Rs.)	15	15	15	15
Limestone (Rs.)	2	2	2	2
Labour cost (Rs.)	35	35	35	35
Miscellaneous (Rs.)	10	10	1	10
Total cost (Rs.)	**255.60**	**268.20**	**271.60**	**273.40**
Final live body weight (kg)	2.06	2.21	2.12	2
Market price (Rs./kg)	132	132	132	132
Total income (Rs.)	**271.92**	**291.72**	**279.84**	**264**
Net profit (Rs.)	**16.12**	**23.52**	**8.24**	**-9.40**

Thus it can be concluded that, inclusion of 2 mL/liter of Herbitol in the diet of the broiler substantially enhanced its growth performance, feed and water consumption, feed ratio and quality of the carcass. The addition also boosted profitability as well as decreasing mortality rates. But raising the dose to 6 mL/liter affected these parameters negatively, which indicates possible

metabolic or digestive stress. The most desirable results were always achieved with the dosage of 2 mL/L, and it did not affect the health and meat quality of the birds, which means that this concentration of Herbitol supplementation was the best to maximize the productivity and profitability of broiler production.

References

Abdelli, N., Solà-Oriol, D., & Pérez, J. F. (2021). Phytogenic feed additives in poultry: Achievements, prospective and challenges. Animals, 11, 3471.

Aminullah, N., Mostamand, A., Zahir, A., Mahaq, O., & Azizi, M. N. (2025). Phytogenic feed additives as alternatives to antibiotics in poultry production: A review. Veterinary World, 18(1), 141–154. https://doi.org/10.14202/vetworld.2025.141-154

Association of Official Analytical Chemists (AOAC). (2000). Official methods of analysis (17th ed.). AOAC International.

Atay, A. (2023). The effect medicinal plants on performance, carcass parameters and meat quality in broiler chickens. Journal of Innovative Science and Technology, 13(2), 1418–1428.

Puvača, N., Ljubojević, D., Stanaćev, V., Kostadinović, Lj., & Beuković, M. (2014). Effects of dietary garlic powder addition on productive performance and meat quality of broiler chickens. **Biotechnology in Animal Husbandry**, 30(4), 669–676.

Kairalla, M. A., A. A. Aburas, and M. I. Alshelmani. 2022. "Effect of Diet Supplemented with Graded Levels of Ginger (Zingiber officinale) Powder on Growth Performance, Hematological Parameters, and Serum Lipids of Broiler Chickens." Archives of Razi Institute 77, no. 6: 2089–2095. https://doi.org/10.22092/ARI.2022.359958.2524.

Bahadori, M. M., Irani, M., Pirsaraei, Z. A., Koochaksaraie, R. R. (2013). The effects of dill powder in diet on some blood metabolites, carcass characteristics and broiler performance. Global Vet., 10, 500-504.

Chattopadhyay, M. K. (2014). Use of antibiotics as feed additives: A burning question. Frontiers in Microbiology, 5, Article 334. https://doi.org/10.3389/fmicb.2014.00334

Cristo, A. B. D., Schmidt, J. M., Benito, C. E., Buzim, R., Pinto, L. A. D. M., & Fernandes, J. I. M. (2022). Effect of the supplementation of plant extracts based additive in broiler chicken diets on productive performance, carcass yield, and meat quality. Brazilian Journal of Poultry Science, 24, eRBCA-2021-1528.

Elagib, H. A. A., Elamin, W. I. A., Elamin, K. M., & Malik, H. E. E. (2013). Effect of dietary garlic (Allium sativum) supplementation as feed additive on broiler performance and blood profile. Journal of Animal Science Advances, 3, 58–64.

El-Sabrout, K., Khalifah, A., & Mishra, B. (2023). Application of botanical products as nutraceutical feed additives for improving poultry health and production. Veterinary World, 16(2), 369–379. https://doi.org/10.14202/vetworld.2023.369-379

Iqbal, S., Leghari, I., Sethar, A., Memon, A., & Bhatti, M. A. (2016). Effect of various levels of commercial Herbitol on the feed efficiency and blood composition of broiler. Case Studies Journal, 5(7), 1–5.

Landers, T. F., Cohen, B., Wittum, T. E., & Larson, E. L. (2012). A review of antibiotic use in food animals: Perspective, policy, and potential. Public Health Reports, 127(1), 4–22.

Lipiński, K., Antoszkiewicz, Z., Kotlarczyk, S., MazurKuśnirek, M., Kaliniewicz, J., & Makowski, Z. (2019). The effect of herbal feed additive on the growth performance, carcass characteristics and meat quality of broiler chickens fed low-energy diets. Archives Animal Breeding, 62, 33–40.

Oleforuh, V. U., Okoleh, G. C., Chukwu, C., & Adeolu, A. I. (2014). Effect of ground ginger and garlic on the growth performance, carcass quality and economics of production of broiler chickens. Journal of Animal Science, 3(3), 225–229.

Omar, J. A., Hejazi, A., & Badran, R. (2016). Performance of broilers supplemented with natural herb extract. Open Journal of Animal Sciences, 6, 68–74.

Orlowski, S., Flees, J., Greene, E. S., Ashley, D., Lee, S. O., Yang, F. L., Yang, C. M., Owens, C. M., Kidd, M., Anthony, N., & Dridi, S. (2018). Effects of phytogenic additives on meat quality traits in broiler chickens. Journal of Animal Science, 96, 3757–3767. https://doi.org/10.1093/jas/sky238

Pirgozliev, V., Mansbridge, S. C., Rose, S. P., Lillehoj, H. S., & Bravo, D. (2019). Immune modulation, growth performance, and nutrient retention in broiler chickens fed a blend of phytogenic feed additives. Poultry Science, 98, 3443–3449.

Rafeeq, M., Rashid, N., Tariq, M. M., Tareen, R. B., Ullah, A., & Mustafa, Z. (2017). Evaluation of alternatives to antibiotic feed additives in broiler production. Pakistan Journal of Zoology, 49, 1063–1069.

Roy, A., Rahman, M. R., Siddiqua, M. T., & Hossain, M. E. (2023). Effects of garlic and neem extract on growth performance and blood biochemical indices in Sonali chicken. Journal of Bangladesh Agricultural University, 21(4), 533–541. https://doi.org/10.5455/JBAU.169945

Salem, H. M., Saad, A. M., Soliman, S. M., Selim, S., Mosa, W. F., Ahmed, A. E., Al Jaouni, S. K., Almuhayawi, M. S., Abd El-Hack, M. E., El-Tarabily, K. A., & El-Saadony, M. T. (2023). Ameliorative avian gut environment and bird productivity through the application of safe antibiotics alternatives: A comprehensive review. Poultry Science, 102.

Windisch, W., Schedle, K., Plitzner, C., & Kroismayr, A. (2008). Use of phytogenic products as feed additives for swine and poultry. Journal of Animal Science, 86(14_suppl), E140–E148.

Zhang, F., Yang, J., Zhan, Q., Shi, H., Li, Y., Li, D., & Yang, X. (2023). Dietary oregano aqueous extract improves growth performance and intestinal health of broilers through modulating gut microbial compositions. Journal of Animal Science and Biotechnology, 14, Article 77. https://doi.org/10.1186/s40104-023-00857-w.

Khattak, F., A. Ronchi, P. Castelli and N. Sparks. 2013. Effects of natural blend of essential oil on growth performance, blood biochemistry, cecal morphology, and carcass quality of broiler chickens. **J. Pout. Sci.** 93 (1): 132-137.

Government of Pakistan (GOP). (2015). Economic Survey of Pakistan 2014–2015. Ministry of Finance. https://www.finance.gov.pk/survey_1415.html.

Sethar A, Bhatti M.A, Sethar G.H, Khan N, 2016. Commercial Herbitol on the Feed Efficiency and Blood Composition of Broiler an Analytical View. Case Studies Journal; Volume 5, Issue 7; 84-91.

Irekhore, O. T., Alli, O. O., Bello, K. O., & Oluwalana, E. O. A. (2020). Growth performance and cost benefits of broiler chickens fed diets containing garlic and ginger powder as additives. Nigerian Journal of Animal Production, 1210–1213. https://doi.org/10.51791/njap.vi.5545.

F. Khattak, A. Ronchi, P. Castelli, N. Sparks, (2014). Effects of natural blend of essential oil on growth performance, blood biochemistry, cecal morphology, and carcass quality of broiler chickens. Poult. Sci., 93 (2014), pp. 132-137.