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Research Article

Influence of asafoetida herbal supplementation on the growth performance and nutrients digestibility in broiler chickens

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Abstract

This study aimed to investigate the effects of asafoetida herb supplementation on the growth performance and nutrients digestibility in broiler chickens. The study used 120 day-old broiler chicks, which were divided into four groups. Group A was kept as a control, while groups B, C, and D were given asafoetida herb at concentrations of 1.5g, 3.0g, and 5.0g/litter, respectively. The results showed that the group given the highest concentration of asafoetida had the highest ($P<0.05$) feed and water intake, live body weight, carcass weight, dressing percentage, and dry matter, protein, and fat digestibility. Additionally, group C showed better ($P<0.05$) feed conversion ratio, while group A had the lowest ($P<0.05$) intake and digestibility values. These herbs can reduce morbidity and mortality rates in broiler chickens. Group D had the lowest morbidity and mortality rates, while group A had the highest. In conclusion, asafoetida herb supplementation in broiler chicken diets can improve their growth performance, including feed and water intake, live body weight, carcass weight, dressing percentage, and dry matter, protein, and fat digestibility. These findings may be useful in the development of new, natural feed additives to improve the growth performance of broiler chickens. Further research is needed to determine the optimal dosage and frequency of asafoetida herb supplementation for broiler chickens.

Keywords: Asafoetida; Broiler Chicks; Digestibility; Growth performance; Herbal supplementation

Introduction

The poultry production industry faces challenges such as infectious diseases, which can negatively impact profitability due to bird loss and high treatment costs. Additionally, concerns over antimicrobial residue violation and resistance require alternative infection prevention strategies [1]. Only good quality feed ingredients are not enough for better feed efficiency and growth performance; it is necessary to properly utilize and absorb the feed. The use of herbal products as a dietary supplement for improving the growth performance and health of poultry has gained significant attention in recent years. Herbal products have been shown to have positive effects on poultry digestion and growth performance [2]. Non-nutritive compounds such as antibiotics, enzymes, and pellet binders are commonly added to poultry feed to boost absorption and growth rate [3]. However, antibiotic use is restricted due to drug tolerance and residue concerns [4]. Aromatic plants and extracts, such as asafoetida, have been used in livestock feed to enhance feed consumption, digestive juice secretion, and immune system [5]. Asafoetida is derived from the plant Ferula asafoetida and is commonly used as a condiment in India and Iran. It has also been found to upregulate gene expression and enhance lysozyme activity in common carp (Cyprinus carpio) [6]. In Ayurvedic medicine, asafoetida is considered both a tasty spice and a reliable medicine and is used in a variety of spice blends, curries, and pickles. It has also been used as a household remedy and can reverse the effects of morphine when given in the same amount as the patient has consumed [7]. Antiviral activity against the influenza A virus has been shown in vitro (H1N1). Medicinal doses of asafetida resin range from 200 to 500 mg [8]. Ferulaasafoetida is one of these plants that has been studied and used in poultry diets because it contains a number of active compounds that have health effects and directly affect human health. The plant extract contains significant amounts of antibiotics, antioxidants, and antimicrobial compounds, and it also reduce blood pressure, enhance the respiratory and digestive systems functions [7]. Asafoetida has gained attention as a natural growth promoter in the poultry industry. Studies have investigated the potential of asafoetida as a feed additive to enhance the growth performance of broiler chickens. One study found that asafoetida supplementation had a positive effect on the growth performance of broiler chicken, particularly at the feeding level of 1%. Birds in the treatment groups had higher body weight and a lower ratio of feed as compared to the control group [9]. These findings suggest that asafoetida could be used as a natural growth promoter in broiler diets, with significant implications for the poultry industry. This research paper aims to further explore the potential of asafoetida as a natural growth promoter for broiler chickens by analyzing its impact on various parameters of growth performance.

Materials and Methods

The current investigation took place at the Poultry Experimental Station, which is located within the Department of Poultry Husbandry, Faculty of Animal Husbandry and Veterinary Sciences at Sindh Agriculture University, Tandojam, Pakistan. The study utilized 120-day-old broilers that were purchased from Almas hatchery in Hyderabad. The chicks had been weighed and equally divided into four groups, each comprising 30 chicks. Asafoetida was not added to Group A, which acted as the control group. Asafoetida herb was added to Group B, C, and D at concentrations of 1.5 g/L, 3.0 g/L, and 5.0 g/L, respectively. Asafoetida powder was dissolved in water, and the resulting solution was offered to the chicks. The birds were kept in a randomized whole block pattern, and the experiment was undertaken in a controlled environment with a standard diet and *adlibitum* water. The chicks were monitored for any changes in growth rate, feed intake, and feed

conversion efficiency over the course of the experiment's six-week duration. The Institutional Animal Ethics Committee's (IAEC) rules were followed in the design of the experiment as well as the handling and care of the birds. Every attempt was made to reduce the suffering and discomfort of the birds throughout the experiment.

Housing management and parameter

The housing structure used in the study was a floor housing system, which is a common type of housing used for broiler chickens. The temperature was gradually reduced from 95°F to 70°F over a period of four weeks, which is a standard practice for broiler rearing. Finally, the section lists the parameters that were measured during the study, including live body weight, water intake, carcass weight, and dressing percentage, feed conversion ratio (FCR), mortality, and nutrient digestibility. Nutrient digestibility was measured through a total collection method, where the complete intake and excretion of nutrients were quantified and analyzed. Fecal samples were collected and analyzed for nutrient content, allowing the calculation of nutrient digestibility based on the difference between intake and excretion.

Data analysis

The data were analyzed using ANOVA with a significance level of 0.05, and the LSD (Least Significant Difference) test was used to detect significant differences among treatments. The conditions for employing the LSD test in statistical analysis involve conducting an ANOVA and working with a small number of treatment groups. The LSD test allows for pairwise comparisons to determine significant differences among means at a predetermined significance level. Statistical analysis included ANOVA with a significance level of 0.05, and the LSD test was used for discerning significant differences among treatments.

Results

Feed intake (g)

Results on the influence of asafoetida herb supplementation on feed intake of broilers are mentioned in (Fig. 1). All groups showed significant differences ($P<0.05$) in feed intake. Data indicates that group D took maximum feed intake (3179.3 g) followed by Group c (2981 g) and Group b (2955.5 g), respectively. While the minimum feed intake (2968.3 g) was observed in group A.

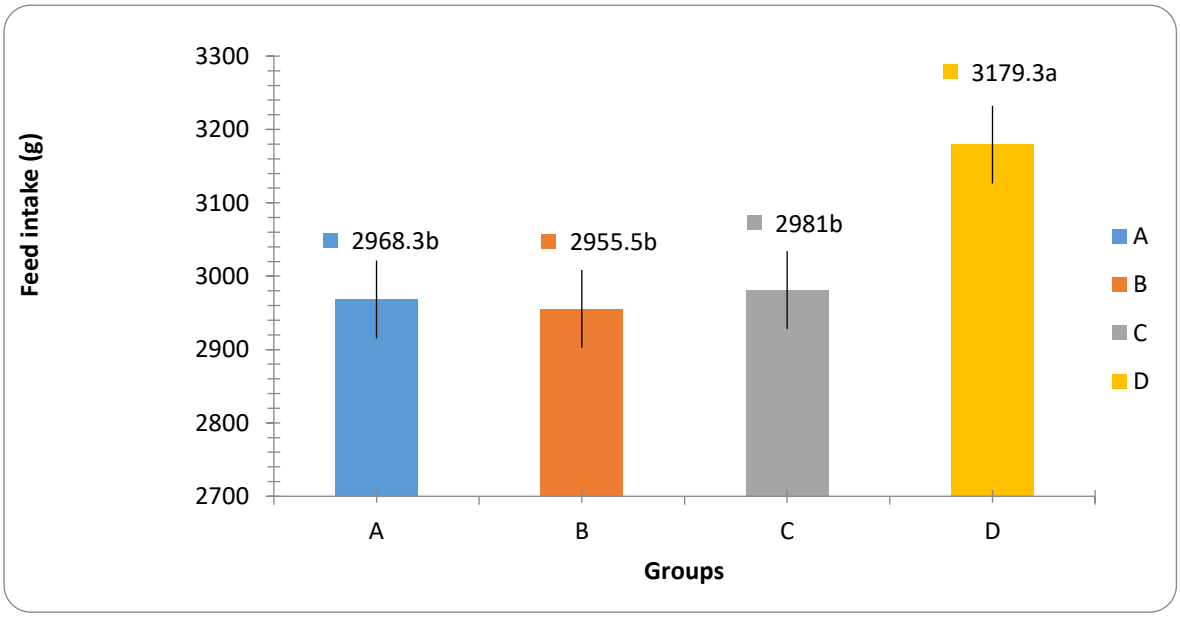


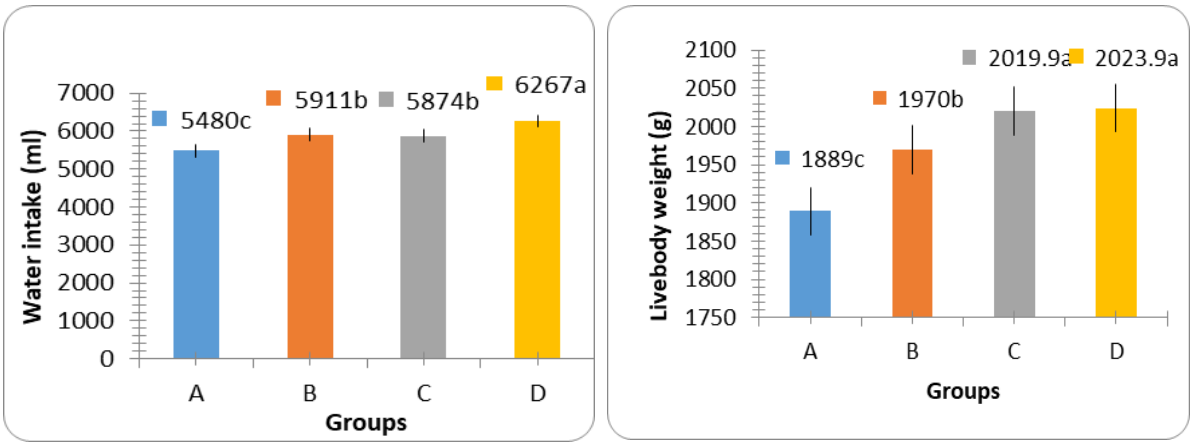
Figure 1. Influence of asafoetida herb supplementation on feed intake (g) of broilers

Water intake (g)

The influence of asafoetida herb supplementation on water intake of broilers is presented in (Fig. 2a). Data indicates that group D had maximum water intake (6267 ml) followed by group B (5911 ml) and group C (5874 ml), respectively. While the minimum water intake (5480 ml) was observed in group A. Statistical analysis of the obtained data showed that there was significant (P<0.05) difference in water intake among the groups.

Live body weight (g)

The influence of asafoetida herb supplementation on live body weight of broilers is mentioned in (Fig. 2b) which showed significant differences (P<0.05) among groups. Data indicates that group D received maximum live body weight (2023.9 g) followed by group C (2019.9 g) and group B (1970 g), respectively. While the minimum live body weight (1889 g) was observed in group A.



a **b**

Figure 2a & b. Influence of asafoetida herb supplementation on Water intake (g) and live body weight (g) of broilers

Carcass weight (g) and dressing (%)

The results of the influence of asafoetida herb supplementation on the carcass weight and dressing percentage of broilers are presented in (Fig. 3a & b), respectively. The data indicates that group D had the highest carcass weight (1262.5 g), followed by group C (1246.8 g) and group B (1209.5 g), while the lowest carcass weight (1163 g) was observed in group A. Statistical analysis showed a significant (p<0.05) difference in carcass weight between the groups. On the other hand, group D had the highest dressing percentage (62.37%), followed by group C (61.71%) and group A (61.58%), while the lowest dressing percentage (61.38%) was observed in group B. The statistical analysis revealed no difference in the dressing percentage of the groups that (P>0.05).

FCR

The impact of adding asafoetida herb to feed on broilers' feed conversion ratio (FCR) was studied and the results are presented in (Fig. 4). The group receiving the highest dosage of asafoetida (group C) showed better feed conversion ratio (P<0.05) than those groups received least dosage of asafetida. The trend of FCR in groups C, B, A and D was 1.47, 1.50, 1.57 and 1.57, respectively.

Morbidity and mortality (%)

The impact of asafoetida herb supplementation on the morbidity and mortality of broilers was also evaluated and the results are presented in (Fig. 5). The data shows that the highest morbidity rate

of 5% was seen in group A, with group B and group C with morbidity rates of 3% each. In contrast, the lowest morbidity rate of 2% was observed in group D. Regarding mortality, the highest rate of 7% was recorded in Group A, followed by Group b and c with mortality rates of 5% each. On the other hand, the lowest mortality rate of 3% was observed in group D. These findings suggest that asafoetida supplementation may have a protective effect against morbidity and mortality in broilers, particularly at higher dosages.

Dry matter (%)

The influence of asafoetida herb supplementation on digestibility of dry matter contents are presented in (Fig. 6) shows that group D had the highest dry matter digestibility (78.46%), followed by group C (76.94%) and group B (75.92%), while the lowest dry matter digestibility (73.19%) was observed in group A. Statistical analysis of the data indicated a significant ($p<0.05$) difference in dry matter digestibility among the groups.

Protein (%)

Results on the influence of asafoetida herb supplementation on protein digestibility are mentioned in (Fig. 7). Data indicates that group D obtained maximum protein digestibility (24.44%, $P<0.05$) followed by group C (23.05%) and group B (22.23%), respectively. While the minimum protein digestibility (21.48%, $P<0.05$) was observed in group A.

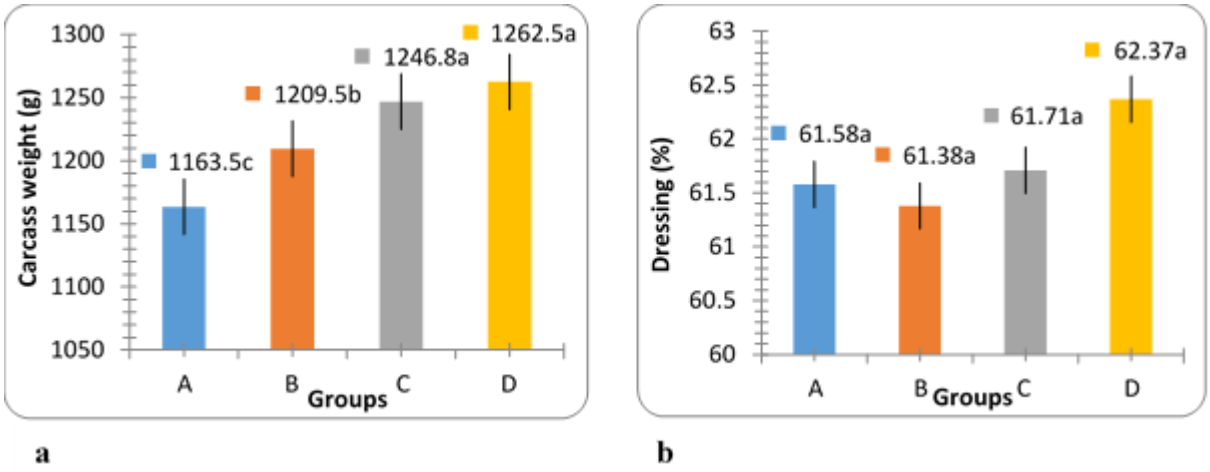


Figure 3a & b. shows Influence of asafoetida herb supplementation on carcass weight (g) and dressing (%) of broilers

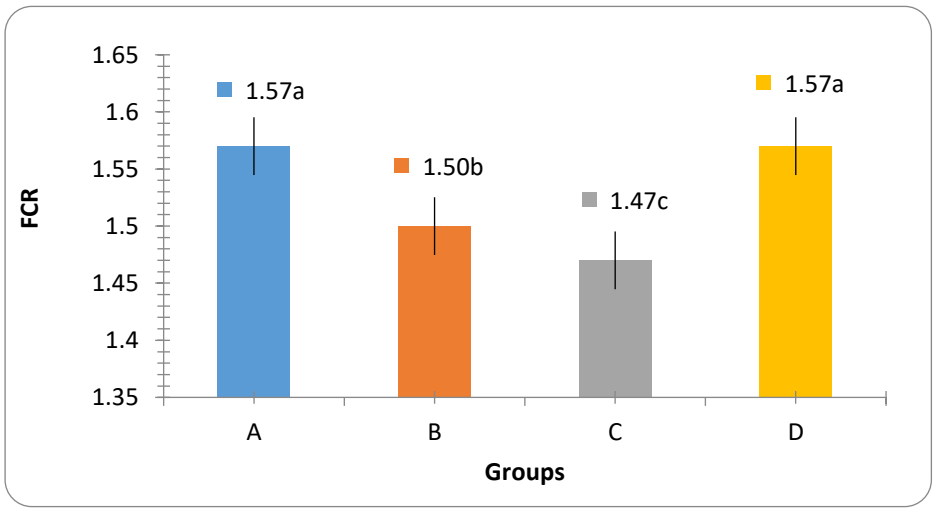


Figure 4. Influence of asafoetida herb supplementation on FCR of broilers

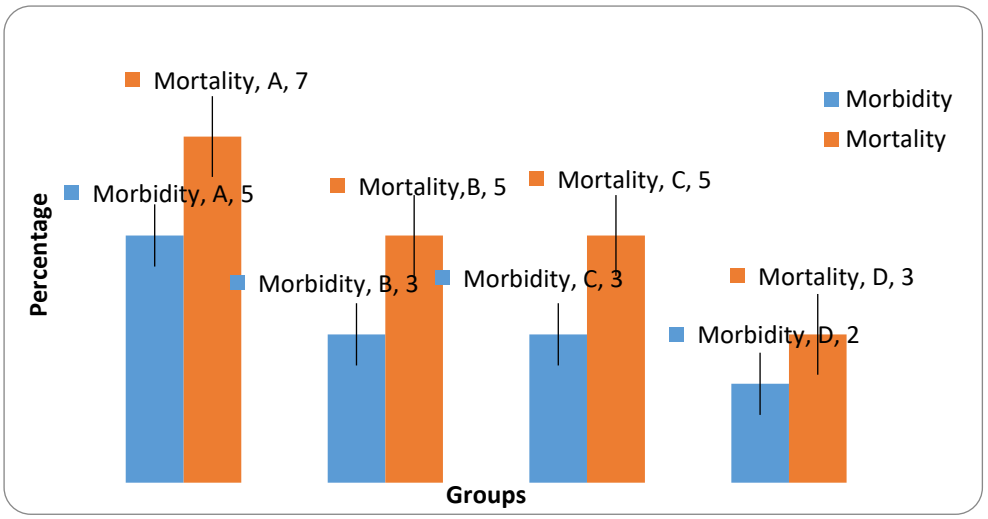


Figure 5. Influence of asafoetida herb supplementation on morbidity and mortality (%) of broilers

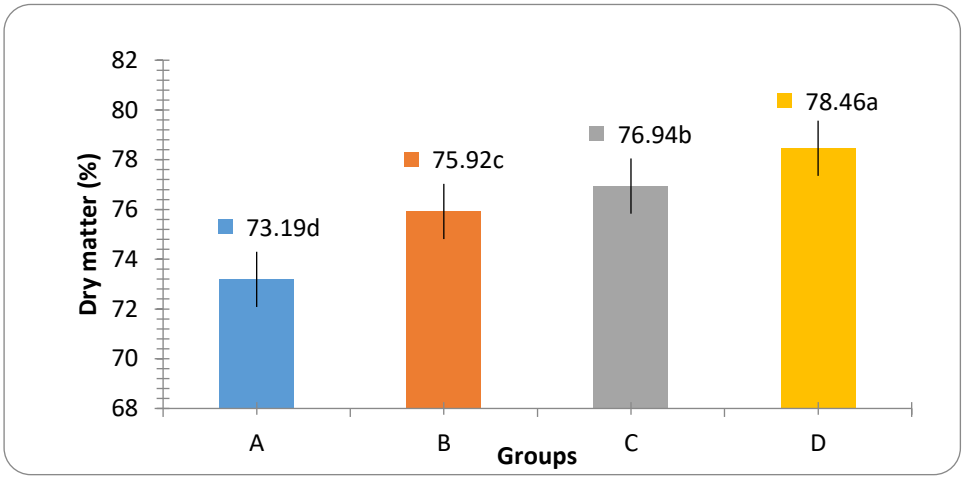


Figure 6. Influence of asafoetida herb supplementation on dry matter (%) digestibility in broilers

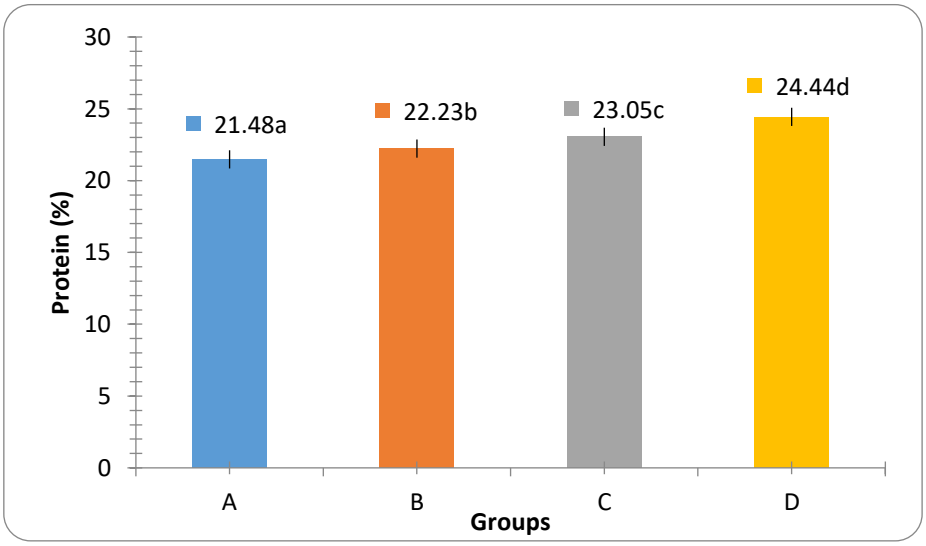


Figure 7. Influence of asafoetida herb supplementation on protein (%) digestibility in broilers

Fat (%)

The influence of asafoetida herb supplementation on fat digestibility is mentioned in (Fig. 8). Data indicates that group D obtained maximum (P<0.05) fat digestibility (4.32%) followed by group C (3.74%) and group B (3.72%), respectively. While the minimum (P<0.05) fat digestibility (2.22%) was observed in group A.

Ash and crude fiber (%)

The influence of asafoetida herb supplementation on ash and crude fiber is mentioned in (Fig. 9a). Data indicates that group A obtained maximum (P<0.05) fat digestibility (10.47%) followed by group B (9.50) and group C (9.48%), respectively. While the minimum (P<0.05) ash digestibility (8.32%) was observed in group D. Asafoetida herb supplementation on ash and crude fiber is mentioned in (Fig. 10b). Data indicates that group A obtained maximum (P<0.05) fat digestibility (2.41%) followed by group C (2.18) and group D (2.13%), respectively. While the minimum (P<0.05) crude fiber digestibility (2.05%) was observed in group B.

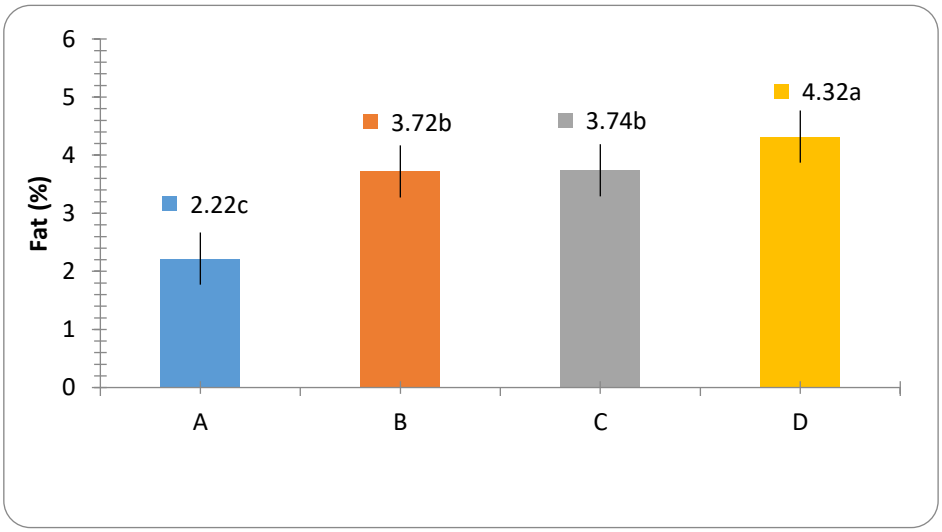


Figure 8. Influence of asafoetida herb supplementation on fat (%) digestibility in broilers

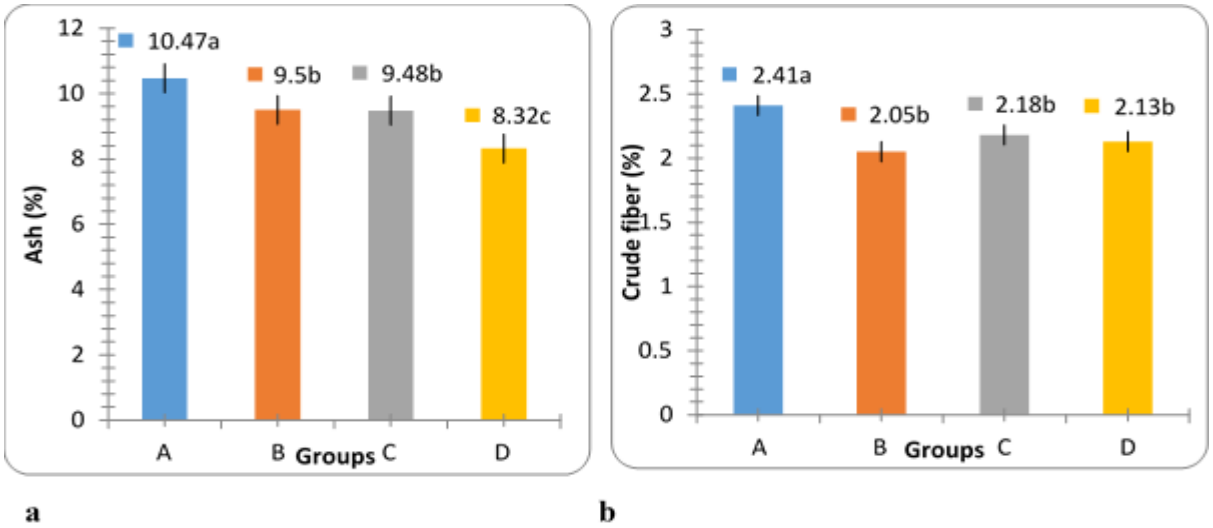


Figure 9a & b. Influence of asafoetida herb supplementation on crude fiber and ash (%) digestibility in broilers

Discussion

Findings of the present study showed that broiler feed was supplemented with 5.0 g of Asafoetida, and this supplementation was provided to the broiler chickens through their drinking water. Resulted in the highest body weight gain and carcass weight, with minimum morbidity and mortality percentage, and maximum dry matter, protein, and fat digestibility. The characteristics of Ferula asafoetida gum formation when added to food or water were significantly increased due to the presence of Alkaloids, phenols, and Alkaloids, phenols, and flavonoids, which influence the growth of tissues and promote protein synthesis, in addition to stimulating the immune system against microbial pathogens [10-12]. These results are in consistent with earlier studies that have reported the enhanced production performance of poultry due to the significant mineral content, which includes calcium, phosphorus, potassium, and ferrate, in Ferula asafoetida [11-13]. It is reported that the increase in body weight with Ferula asafoetida feeding may be attributed to the presence of a sugar compound, which aids in lipid digestion, or the high content of volatile fatty acids, esters, and coumarin acid derivatives, which act as digestive enhancers and may help to reduce energy loss. However, it is unclear if these effects are specific to poultry or if they can be generalized to other animals or humans, suggested that Ferula asafoetida may improve poultry performance by reducing the activity of pathogenic bacteria in the digestive system. This could potentially lead to better overall health and improved growth rates in poultry of birds [7, 11]. The results were also supported by the studies of [14-16]. They have emphasized the critical part Ferula asafoetida plays in promoting excretions from the digestive system, while [17]. Reported that adding Ferula asafoetida to poultry diets increases the synthesis of digestive enzymes, which positively reflect the feed conversion coefficient. According to Shadmani et al., birds fed a meal containing 0.75 percent Ferula asafoetida experienced the greatest body weight increase (BWG). In another study [18] found a significant increase in the average live body weight and total body gain in all treatments supplemented with Ferula asafoetida gum either to the diet or drinking water. Although there were no discernible impacts on total feed consumption, T2 and T4 showed a considerable improvement in total feed conversion coefficient compared to T1. These outcomes are consistent with a number of earlier investigations [11, 13] where gain in production efficiency was recorded because Ferula asafoetida contains high levels of vital minerals like calcium, phosphorus, potassium, and ferrate. Additionally, the gum contains a number of substances like flavonoids, alkaloids, and phenols that influence tissue formation, promote protein synthesis, and immune system against microbial pathogens [10]. According to other studies, feeding Ferula asafoetida can improve chicken performance by decreasing the activity of pathogen bacteria inside the birds' digestive systems [7, 11, 14-16]. These studies have also highlighted the important role of Ferula asafoetida in stimulating the digestive system excretions, while few authors [17] have reported an increase in digestive enzymes production due to the use of Ferula asafoetida in poultry diets [6]. Overall, these results indicate that Ferula asafoetida can be an effective feed supplement for improving production traits in poultry.

Conclusion

The study investigated the impact of asafoetida herb supplementation on various parameters in broiler chickens. Results showed that supplementing broiler feed with 5.0 g of asafoetida in drinking water led to improved feed intake, water intake, body weight gain, carcass weight, and digestibility of nutrients. Group D, receiving the highest dosage, exhibited the most favorable outcomes, including reduced morbidity and mortality rates. These findings have significant implications for the poultry industry as they indicate that asafoetida supplementation can enhance broiler performance and nutrient utilization. Furthermore, the study highlights the potential of asafoetida as a natural feed additive to optimize broiler growth and health. Further research is warranted to determine optimal dosages and application methods for commercial implementation.

Authors' contributions

Conceived and designed the experiments: NU Marri, N Rajput & AA Moryani, Performed the experiments: NU Marri, NM Marri, J Khaliq, A Qayum & S Iqbal, Analyzed the data: S Solangi & M Faheem, Contributed materials/ analysis/ tools: M Ahmed, A Ghafoor, S Namood & AS

Shahani, Wrote the Paper: A Kabir & AU Rahman.

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