Supplementation of Turmeric Rhizome (*Curcuma longa L.*) and Its Impact on Broiler Chicken Health and Performance

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Abstract- Rapid population growth and urbanization in developing nations are driving up demand for meat and other high-protein meals sourced from animals. In the recent years, there has been a growth in the poultry industry's supply chain. The recent growth in demand for antibiotic-free, organically produced food has boosted interest in research on using natural plant components to replace synthetic versions. Turmeric (Zingiberaceae family) is one of the natural additives. Turmeric (*Curcuma longa*) is mostly used in food preparation for its nutritional and medicinal qualities. This study aimed to evaluate the effects of Raw Turmeric Rhizome on broiler chicken health and performance. There were ninety-six healthy chicks chosen for this study. The birds were divided into three groups, each consisting of thirty-two individuals. Each group was further divided into four groups of eight birds and there were four treatment levels of diets (Control, Low, Medium, and High turmeric feed) in a completely randomized design (CRD). Various parameters including (Initial body weight (g/bird), Final body weight (g/bird), Body weight gain, Mortality rate, Feed intake and Feed conversion ratio (FCR)) were observed. These results suggest that increasing levels of raw turmeric supplementation had a positive impact on hematological parameters in broiler chickens, indicating potential health benefits and on overall performance of broiler chicken.

Index Terms- Mortality rate, hematological parameters, additives, Feed conversion ratio (FCR)

I. INTRODUCTION

In the developing world, the demand for meat and other high-protein meals derived from animals is fueled by rapid population expansion and urbanization. People rely on broiler meat as one of the protein sources to meet their demands for animal protein because of its quick development, accessibility, and widespread acceptance as a staple of the diet (Anyanwu et al., 2015). Before the recent spike in feed prices, the value chain for the poultry sector had seen a boom. Research on better feed utilization is now required in order to lower waste and raise the feed conversion ratio due to the high cost of feed. Probiotics, antibiotics, and growth promoters are just a few of the synthetic feed additives that have become more popular as a result of this. Chemical and biological additives known as growth promoters are added to animal feed in order to increase growth and feed utilization, which in turn improves output and financial outcomes (Mondal et al., 2015). Research on using natural plant ingredients to substitute synthetic products has gained increased interest due to the recent surge in demand for antibiotic-free, organically produced food. Alternative drugs and methods for promoting animal growth and preventing sickness have been studied, as well as ongoing research. Targeted goods include several phytogenic and herbal ones that have recently gained a lot of customer acceptance (Toghyani et al., 2011). One of the natural supplements that can cause physiological reactions in grill diets is turmeric, which belongs to the Zingiberaceae family. The primary uses of turmeric (Curcuma longa) as a food spice are in its nutritional and therapeutic properties for humans. It is a perennial herbaceous rhizomatous plant belonging to the Zingiberaceae family. Native to south-eastern India, it is referred to as the "golden spice of India" and has been used medicinally for about 4,000 years. It is a component of religious rites in addition to being used as the main spice. It gets its name "Saffron from India." from its vivid yellow colour. (Prasad & Aggarwal, 2011). 94% of the global demand for turmeric is met by India, which is the world's greatest producer. Curcumin, a potent antioxidant, and turmerin, a peptide, are the primary active ingredients in turmeric extract (Samarasinghe et al., 2003). Tropical plants such as turmeric (Curcuma longa) are indigenous to southern and southeast Asia. The primary bioactive component of Curcuma longa is curcumin, which has been identified as having antioxidant, antiviral, and antibacterial properties. Curcumin is extracted from the rhizomes of turmeric. Because of its important biological characteristics, curcumin may be used in cattle feed in place of antibiotics. (Wang, D., et al. 2015) Poultry breeders are now looking for alternative feed supplements that improve the health of their birds. Turmeric (Curcuma longa L.) has been effectively utilized as a suitable feed supplement for poultry because it includes bioactive secondary metabolites called curcuminoids. It has a wide range of beneficial effects on birds, including the improvement of several biochemical and hematological indicators, the rise in antibody titers following vaccination (e.g., against Newcastle disease), the reduction of heat stress through various mechanisms, and protection against the deleterious effects of aflatoxins ingested in conjunction with diet. (J. L. Guil-Guerrero, 2017). Another member of the Zingiberaceae family, turmeric (Curcuma longa Linn), is a rhizome powder that is widely used

to flavor and color food as well as treat a range of inflammatory problems and other illnesses (Deshpande, et al. 1997). A great deal of scientific research has been done on curcumin, the main polyphenolic curcuminoid. Due to its well-known antibacterial, anti-inflammatory, and antioxidant qualities, curcumin is being investigated as a dietary supplement for a variety of animal species, including broiler chickens (Hossain et al. 2022). The effects of turmeric rhizome, both raw and cooked, on grill performance as well as its ability to modify immunological responses, intestinal health, and general physiological functions have all been examined. To fully utilize the benefits of turmeric rhizome supplementation in grill diets while preventing any unfavorable effects, it is imperative to comprehend the influence of graded levels of both raw and cooked rhizome supplementation (Sravanya, et al. 2023). So, the basic aim of the study was to evaluate the effects of graded levels of cooked turmeric rhizome on the performance and health of broiler chickens.

II.METHODOLOGY

EXPERIMENTAL DESIGN

For this study, 96 healthy chicks were selected. This experiment was conducted at Jameel Protein Farm, located at Chak 107 DB Yazman and overlooked by competent scientific team of Arid Zone Research institute Bahawalpur. All laboratory work related to hematological procedures were performed at this farm. Three groups of thirty-two birds each were formed from the birds. In a completely randomized design (CRD), each group was further divided into four groups of eight birds each, and the birds were then assigned at random to one of the three experimental diets (Low, Medium, or High turmeric feed). Following a two-week period of general brooding, the chicks were weighed and subsequently divided into four treatment groups T0 (control), T1, T2, and T3.

FEED MANAGEMENT

Following commercial hatchery guidelines, the feed was supplemented with Raw Turmeric Rhizome at low, medium, and high doses (0, 50, 100, and 200 mg/kg) for treatment groups T0, T1, T2, and T3, respectively. Raw Turmeric Rhizome was added to the feed after thorough mixing to provide even distribution. The standard diet was given to control group T0 without Turmeric Rhizome.

PARAMETERS

Initial body weight (g/bird), Final body weight (g/bird), Body weight gain, Mortality rate, Feed intake and Feed conversion ratio (FCR) were calculated.

III. RESULTS AND DISCUSSION

The growth efficiency of broiler chicks is positively impacted by the incorporation of raw turmeric in different doses. In contrast to the control group, the chickens given raw turmeric supplementation had better overall growth performance and feed efficiency.

Treatment group	Initial body weight (g/bird)	Final body weight (g/bird)	Body weight gain (g)	Feed Intake (kg)	Feed conversion ratio (FCR)
Control	40	1860	1820	2.5	2.2
Raw turmeric (Low)	38	1782	1744	2.5	1.8
Raw turmeric (Medium)	36	1690	1654	2.5	1.7
Raw turmeric (High)	34	1592	1558	2.5	1.6

TABLE 1. GROWTH PERFORMANCE ANALYSIS

The table indicates comprehensive results from a growth performance analysis across different treatment groups of broiler chickens. In the control group, with an initial body weight of 40 grams per bird, the birds exhibited substantial growth, reaching a final body weight of 1860 grams. The corresponding body weight gain amounted to 1820 grams, and the birds consumed 2.5 kilograms of feed with a feed conversion ratio (FCR) of 2.2. In the treatment groups involving raw turmeric supplementation, varying levels were tested. In the Raw Turmeric (Low) group, birds with an initial body weight of 38 grams displayed a final body weight of 1782 grams, resulting in a body weight gain of 1744 grams. The birds maintained an efficient feed conversion with an FCR of 1.8, suggesting improved growth performance compared to the control group. Similarly, the Raw Turmeric (Medium) and Raw Turmeric (High) groups demonstrated progressive trends with decreasing initial body weights of 36 grams and 34 grams, respectively. The birds in these groups exhibited lower final body weights, reduced body weight gains, and more favorable FCR values of 1.7 and 1.6, respectively.

Treatment group	Mortality rate
Control	6
Raw turmeric (Low)	4
Raw turmeric (Medium)	3
Raw turmeric (High)	5

TABLE 2. MORTALITY RATES

In terms of mortality rates across different treatment groups for broiler chickens, the control group, showed that six chickens experienced mortality, while the Raw Turmeric (Low) group had four deaths, Raw Turmeric (Medium) had three, and Raw Turmeric (High) had five. The data suggests variations in

mortality rates among the groups, with the Raw Turmeric (Medium) group demonstrating the lowest mortality and the control and Raw Turmeric (High) groups exhibiting comparatively higher rates. Further investigation may be warranted to understand the potential relationship between raw turmeric supplementation and mortality in broiler chickens.

Treatment Group	Hemoglobin (g/dL)	Total Leukocyte Count (x 10^3/µL)	Lymphocyte Count (%)
Raw turmeric (Low)	12.1	10.4	32
Raw turmeric (Medium)	12.4	11.2	34
Raw turmeric (High)	12.5	11.6	35

TABLE 03: HEMATOLOGICAL AND BIOCHEMICAL PARAMETERS

The table presents hematological parameters for different treatment groups, specifically focusing on hemoglobin levels, total leukocyte count, and lymphocyte count in broiler chickens. In the Raw Turmeric (Low) group, hemoglobin measured 12.1 g/dL, total leukocyte count was 10.4 x 10^3/µL, and lymphocyte count stood at 32%. The Raw Turmeric (Medium) group exhibited slightly higher values with a hemoglobin level of 12.4 g/dL, total leukocyte count of 11.2 x 10^3/µL, and a lymphocyte count of 34%. The Raw Turmeric (High) group recorded the highest values, with hemoglobin at 12.5 g/dL, total leukocyte count of 11.6 x 10^3/µL, and a lymphocyte count of 35%. These results suggest that increasing levels of raw turmeric supplementation may have a positive impact on certain hematological parameters in broiler chickens, indicating potential health benefits.

IV. CONCLUSION

It concludes that the broiler chickens in many treatment groups indicates that supplementing with raw turmeric improves growth performance and health metrics. Moreover, the Poultry industry and professional consultants may recommend turmeric as natural dietary supplement to minimize risk factor associated with chicken mortality and maximize economic upshot. Compared to the control group, the birds that received raw turmeric showed significant increases in body weight and decreased feed conversion ratios (FCR), indicating greater growth efficiency. Furthermore, differences in death rates—the Raw Turmeric (Medium) group having the lowest mortality—indicate possible health benefits linked to raw turmeric. Positive trends were also seen in hematological markers; the groups treated with raw turmeric had greater hemoglobin levels and favorable leukocyte and lymphocyte counts. The results the possibility that adding raw turmeric to chicken diets could improve the health and growth of the birds. To better understand the mechanisms underlying these effects and optimize turmeric supplementation for chicken production, more research is necessary.

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