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CHANGE IN CONCENTRATION OF CARBOHYDRATE, PROTEIN, AND LIPID AFTER MARINATION WITH TURMERIC IN MUSCLE TISSUES OF *GALLUS GALLUS* AT DIFFERENT INTERVAL OF TIME

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ABSTRACT Fresh muscle tissues of chicken were collected from the local chicken meat market at Nuapadhi. They were brought to the laboratory by wrapping with an aluminum foil in an ice filled container. Then the fresh muscle pieces were marinated with turmeric powder for 1 hours, 2 hours and 3 hours respectively. After that they were prepared for different biochemical assay. Protein, lipid, and carbohydrate were estimated and compared. The level of protein of muscle treated with turmeric powder were 164.736±17.033, 155.24±19.586, 134.023±12.713, 121.736±7.394 in 0,1,2,3 hours respectively. The level of lipid of muscle treated with turmeric powder were 95.805±8.751097, 87.07±8.3123, 75.702±2.601, 66.497±2.258 in 0,1,2,3 hours respectively. The level of carbohydrate of muscle treated with turmeric powder were 90.217±6.724, 76.652±4.333, 67.142±1.777, 59.33±4.926in 0h, 1h, 2h, 3 hours respectively. Marination of chicken muscle with turmeric powder leads to a significant reduction in protein, lipid, and carbohydrate content over time, likely due to turmeric bioactive compounds. These findings suggest that the choice of marinade and marination time can significantly alter the nutritional profile of chicken, with implications for cooking, food processing.

KEYWORDS : protein, lipid, carbohydrate, muscle, turmeric powder

INTRODUCTION

Actions of free radicals and reactive oxygen species (ROS) during stress result in cell wall damage and cell function loss (Borges et al., 2003). The high levels of free radicals production in the body can induce lipid peroxidation and affect the meat quality indices (Silva et al., 2002). Heat stress leads to the induction of oxidative stress and adversely affects the vital functions of the cell such as transcription, RNA processing, translation, metabolism and membrane structure (Iwagmi, 1996). Moreover, heat stress possibly decreases the metabolic antioxidant capacity of the body (Azad et al., 2010). Hence, the concentrations of dietary pro-oxidants and antioxidants can affect lipid peroxidation of poultry products (Ruiz et al., 1999). The universal acceptance of chicken meat across different religions and cultural backgrounds further enhances its appeal and consumption. These religious dietary preferences shape food consumption patterns and influence the availability and variety of meats in different regions, reflecting the cultural and religious diversity of the population (Srinivas,2011). The nutritional benefits and palatability of local chicken products thus not only support individual health but also symbolize broader economic well-being (Chera, 2020). This growing popularity indicates a shift in consumer habits, with more people opting for these easy-to-prepare and delicious poultry options as part of their regular diet (Sampers et al., (2012). The presence of essential amino acids in chicken meat is crucial for maintaining a healthy diet. Additionally, it contributes to human nutrition by providing a wide range of micro and macro nutrients. Poultry meat is often preferred over other meats globally because it is affordable, readily available, and free from religious restrictions (Prabakaran, 2012). Turmeric has antioxidant and anti-bacterial properties due to presence of a bioactive components i.e. curcumin. Introducing turmeric into meat marinades can inhibit lipid oxidation, therefore improve the meat shelf life and maintain its color and flavor and tenderness. Additionally, turmeric antimicrobial properties help reduce bacterial contamination, contributing to the preservation and quality of the meat (Polas *et al*.,1991). Turmeric is the rhizome of *Curcuma longa L*. and has beneficial effects on human health (Nishigm et al., 2005). These components are the main antioxidant compounds of turmeric (Cousin et al., 2007).

MATERIALS AND METHODS

The present work is to estimate the different biochemical parameters of muscle tissue of *Gallus gallus* after marinate with turmeric powder. It has been observed that the level of protein and carbohydrate were decreased in comparison to control after treated with turmeric powder. But in case of lipid the level of lipid was lowest at control and it then gradually increases at 1h,2h and 3 hours respectively.

Methods

The three essential food value parameters which is the basis or in other words the backbone of nutrition are proteins, lipids and carbohydrates were estimated by Lowry *et al*., (1951), Folch *et al*., (1957) and Anthrone method accordingly.

RESULTS

Time independent variations in the concentration of protein, lipid and carbohydrate were seen in muscle of *Gallus gallus*, after treated with turmeric powder. The biochemical analysis of carbohydrate, lipid and protein concentration which is treated with showed that the level of protein in muscle treated with turmeric powder were 164.736±17.033, 155.24±19.586, 134.023±12.713, 121.736±7.394 in 0h,1h,2h and 3 hours respectively. The paired t-tests between time points are statistically significant ($p < 0.05$), confirming that the decreases over time are meaningful and not due to random variation. Protein content was generally highest among the three biomolecules and exhibited a significant decline over time in both treatments and tissue types. The paired t-tests confirmed statistically significant decreases in protein levels at 2 and 3 hours compared to initial values ($p<0.05$), specifically under turmeric treatment. The level of protein is highest at control and it then gradually decreases at 1h,2h and 3 hours respectively. The level of lipid in muscle treated with turmeric powder were 95.805±8.751097, 87.07±8.3123, 75.702±2.601, 66.497±2.258 in 0h,1h,2h and 3 hours respectively. In case of lipid content, turmeric powder treated samples exhibited a gradual reduction in lipid concentration with increasing marination time. The decrease is statistically significant ($p<0.05$), particularly between 0 hour and 3-hour intervals. This may be due to the activity of turmeric powder, which decreases lipid deposition. The level of lipid is lowest at control and it then gradually increases at 1h,2h and 3 hours respectively. The level of carbohydrate in muscle treated with turmeric powder were 90.217±6.724, 76.652±4.333, 67.142±1.777, 59.33±4.926 in 0h,1h,2h and 3 hours respectively. In case of carbohydrate, the treatment exhibited a decreasing trend with time in muscle tissues. turmeric powder caused a significant decline in carbohydrate concentration, with significant differences ($p<0.05$) at most all the time. The level of carbohydrate is highest at control and it then gradually decreases at 1h,2h and 3 hours respectively.

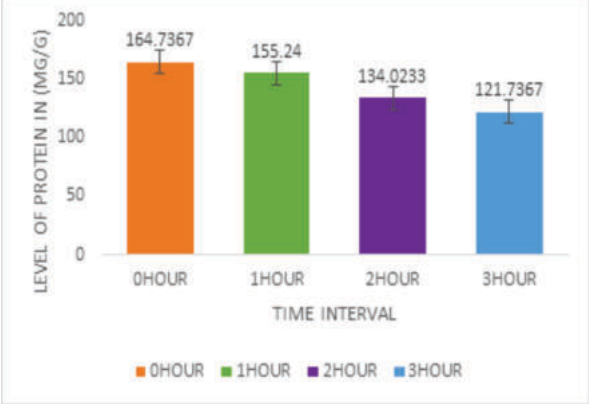

Fig-1: Level of protein(mg/g) in tissue of muscle of *Gallus gallus* treated with turmeric

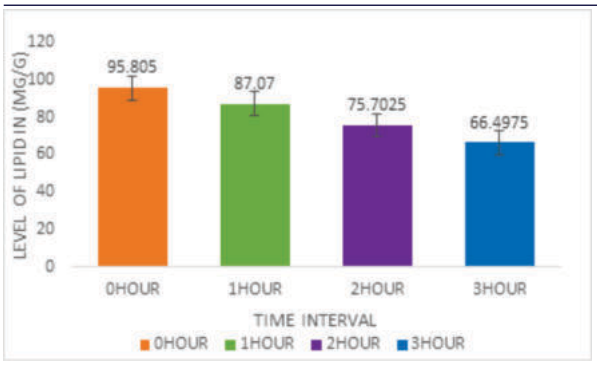

Fig-2: Level of lipid in tissue *of muscle of Gallus gallus* treated with turmeric

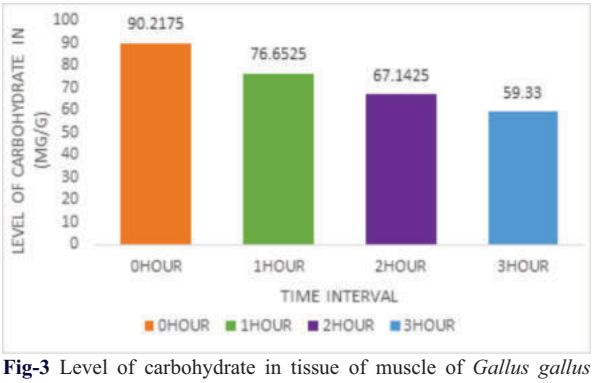

Fig-3 Level of carbohydrate in tissue of muscle of *Gallus gallus* treated with turmeric

It is confirmed from the paired t-tests performed that the differences in protein, lipid, and carbohydrate concentrations between time intervals were statistically significant in most cases ($p < 0.05$). This affirms that the biochemical changes were not due to random variation but the result of marinade-induced biochemical processes. Turmeric powder induced selective changes, primarily enhancing lipid content due to passive diffusion and absorption while reducing proteins and carbohydrates likely due to hydrolysis and metabolic degradation.

DISCUSSION

A work was done to investigate the effects of dietary supplementation with turmeric powder as a natural growth promoter on performance and serum biochemical profile in broiler chickens. The result showed a significant decrease in food convert ratio and in turn improved feed efficiency aspartate amino transferase, alanine transaminase and total cholesterol increased in group that received the highest concentration of turmeric (George *et al*.,2020). A work was performed to investigate the antimicrobial effect of turmeric powder (*Curcuma longa*) on broiler chicken carcasses during the decontamination process. In this study broiler samples were kept under control after dividing them into three groups i.e., a control (Group A) a turmeric treated for 1 minutes (Group B), A turmeric treated for 5 minutes (Group C). The result showed a reduction in bacterial counts in turmeric treated groups. A most effective reduction was observed in 5-minute treatment group. So, it was concluded that turmeric powder can be served as a natural, and effective decontaminant for reducing microbial contaminations in broiler chicken. (Muthulakshmi *et al.*, 2024)

A notable decline in protein concentration was observed in muscle tissues with increasing marination time in turmeric powder groups. This reduction may be due to proteolytic enzyme activity.

CONCLUSION:

The results of this study exhibited that marination time and type of marinade (turmeric powder) significantly affect the biochemical composition of muscle tissues in *Gallus gallus*. turmeric powder marination causes significant decreases in protein, lipid and carbohydrate due to the presence of bioactive components curcumin which has enzymatic and antioxidant actions. This occurred due to prolonged time marination. Statistical analysis (t-test, correlation matrices) consistently supports these patterns and confirm that marination time correlates strongly with changes of macromolecular content. The statistical analysis confirms that marination time significantly affects the biochemical composition of chicken tissues. These findings suggest that natural marinades have significant biochemical effects on chicken tissue composition depending upon duration and substances used. It can inhibit lipid peroxidation. In turmeric powder marination the concentration of protein, lipid and carbohydrate decreased. The decline in protein, lipid and carbohydrate may be due to breakdown of the macromolecules during the marination process.

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