



## VARIATION IN CONCENTRATION OF CARBOHYDRATE, PROTEIN AND LIPID IN LIVER AND MUSCLE TISSUES OF GALLUS GALLUS TREATED WITH MUSTARD OIL AND TURMERIC POWDER AT DIFFERENT TIME INTERVAL

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**ABSTRACT** Fresh muscle tissues of chicken were collected from the local chicken meat market at Nuapadhi. They were brought by wrapping with an aluminum foil in a ice filled container to the laboratory of Fakir Mohan University. 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 in muscle treated with turmeric were  $164.73 \pm 17.03$ ,  $155.24 \pm 19.58$ ,  $134.02 \pm 12.71$ ,  $121.73 \pm 4.93$  in 0h, 1h, 2h and 3 hours respectively. The level of lipid in muscle treated with turmeric  $95.80 \pm 8.75$ ,  $87.07 \pm 8.31$ ,  $75.7025 \pm 2.60$ ,  $66.49 \pm 2.25$  in 0h, 1h, 2h and 3 hours respectively. The level of carbohydrate in muscle treated with turmeric were  $90.21 \pm 6.72$ ,  $76.65 \pm 4.33$ ,  $67.14 \pm 1.77$ ,  $59.33 \pm 4.92$  in 0h, 1h, 2h and 3 hours respectively. The paired t-tests performed confirmed that the differences in protein, lipid, and carbohydrate concentrations between time intervals were statistically significant in most cases ( $p < 0.05$ ). This reveals that the biochemical changes were not due to random variation but the result of marinade-induced biochemical processes.

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

### INTRODUCTION

Chicken meat is consumed widely due to its high nutritional value. It is a source which is rich in high-quality of protein, amino acids, vitamins and minerals, which make it a chief in many diets (Aker, 2009). The presence of essential amino acids in chicken meat is important for maintaining a healthy diet. It provides a wide range of micro and macro nutrients to human nutrition. Over other meats, poultry meat is often preferred globally because it is easily available, low in cost and free from religious restrictions (Prabakaran, 2012). Fresh chicken meat is also highly preferred due to its beneficial healthy composition (Yu et al., 2005). In poultry meat n-3 poly unsaturated fatty acids is mostly found. Marination is a food processing technique where raw or cooked meat is kept in a seasoned liquid mixture called a marinade (Lawrie, 1998). This mixture usually contains acids (like vinegar or citrus juice), enzymes (from fruits like papaya or pineapple) and various spices. The main aim of marination is to increase the flavor, tenderness and overall qualities. (Lopes et al., 2022). Proteins and connective tissues of meat are break down by acids and enzymes make it more tender and easier to chew. (Gomez et al., 2020). The marination process not only improves the meat's texture but also plays a significant role in its maturation, accelerating the development of desired qualities. According to (Goli et al., 2014), marination enhances the sensory and textural qualities of meat, making it more appealing to consumers. 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 improving the meat shelf life and maintaining 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).

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, lipid and carbohydrate were decreased in comparison to control after treated with turmeric powder.

### MATERIALS AND METHOD

#### Collection And Preparation Of Sample

The samples of liver and muscle of chicken were collected from the local market of Nuapadhi. The tissue samples were covered with an aluminum foil. To maintain the biochemical integrity and freshness, these tissues were kept in an ice box carefully. Then they were brought to the laboratory. 0.5 gram of both tissues were taken from fresh condition and marinated with turmeric powder for analysis.

After that a sterile motor and pestle was taken and the weighed tissue was taken into motor pestle. Then a sufficient volume of distilled water was added based on the amount of tissue for homogenization until no visible tissue pieces remained. After that a pipette was used to place the homogenate mixture into sterile centrifuge tubes and labelled them.

The labelled tubes were centrifuged for 10 minutes at 4000 rpm. Then the centrifuge tubes were taken from the machine carefully without disrupting the pellet. Then gently supernatant was placed in a clean tube. Above processes were carried out for four times for muscle and liver tissues of different chicken.

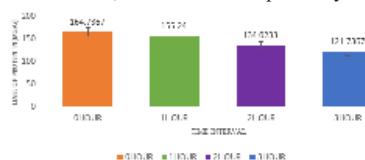
### METHOD

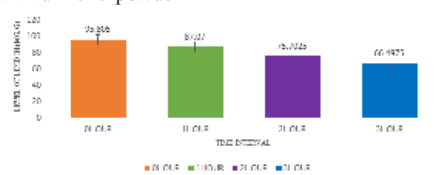
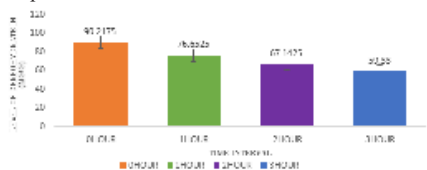
The three essential food value parameters which is the basis or in other words the backbone of nutrition are proteins, lipids and carbohydrates were estimated by Lowry et al., (1951), Folch et al., (1957) and Anthrone method accordingly.

### RESULTS

The biochemical analysis of carbohydrate, lipid, protein concentration in liver and muscle of Gallus gallus, which is treated with turmeric powder revealed time independent variations in the concentration of protein, lipid and carbohydrate.

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 in muscle treated with turmeric were  $164.73 \pm 17.03$ ,  $155.24 \pm 19.58$ ,  $134.02 \pm 12.71$ ,  $121.73 \pm 4.93$  in 0h, 1h, 2h and 3 hours respectively. The level of protein is highest at control and it then gradually decreases at 1h, 2h and 3 hours respectively. In case of lipid content, turmeric treated samples exhibited a gradual reduction in lipid concentration with increasing marination time. The decline is statistically significant ( $p < 0.05$ ), particularly between 0 hour and 3-hour intervals. This may be due to the antioxidant activity and enzymatic activity of curcumin, which reduces lipid deposition. The level of lipid in muscle treated with turmeric  $95.80 \pm 8.75$ ,  $87.07 \pm 8.31$ ,  $75.7025 \pm 2.60$ ,  $66.49 \pm 2.25$  in 0h, 1h, 2h and 3 hours respectively. The level of lipid is highest at control and it then gradually decreases at 1h, 2h and 3 hours respectively. In case of carbohydrate, both treatments exhibited a decreasing trend with time in muscle and liver tissues. Turmeric caused a significant decline in carbohydrate concentration, with significant differences ( $p < 0.05$ ) at most all the time. The level of carbohydrate in muscle treated with turmeric were  $90.21 \pm 6.72$ ,  $76.65 \pm 4.33$ ,  $67.14 \pm 1.77$ ,  $59.33 \pm 4.92$  in 0h, 1h, 2h and 3 hours respectively. 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 powder**Fig-2:** Level of lipid (mg/g) in tissue of muscle of Gallus gallus treated with turmeric powder**Fig 20:** Level of carbohydrate in tissue of muscle Gallus gallus treated with turmeric powder

The paired t-tests performed confirmed 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. Overall, turmeric marination led to consistent declines in all macronutrient levels, pointing to its potent enzymatic and antioxidant influence. In contrast, mustard oil 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 notable decline in protein concentration was observed in both liver and muscle tissues with increasing marination time in both turmeric and mustard oil groups. This reduction may be due to proteolytic enzyme activity and oxidative reactions induced by turmeric bioactive components, particularly curcumin. Curcumin has been reported to modulate protein structures through oxidative mechanisms, leading to reduced solubility and denaturation of proteins in meat tissues (Sharma et al., 2020). The results reveal with previous studies indicating that marination with plant-based antioxidants may compromise protein integrity over time (Dashdorj et al., 2015).

In carbohydrate both treatments exhibited a decline in carbohydrate concentration, with a sharper reduction in turmeric-treated tissues. This may be a result of glycolytic enzyme activation or degradation of glycogen due to exposure to turmeric compounds, which may trigger stress-related metabolic pathways leading to carbohydrate catabolism (Jayathilakan et al., 2012).

But here, in this study it was found that the level of carbohydrate, lipid and protein were decreased according to the increase of the time of marination of turmeric powder. The level of protein in muscle treated with turmeric were  $164.73 \pm 17.03$ ,  $155.24 \pm 19.58$ ,  $134.02 \pm 12.71$ ,  $121.73 \pm 4.93$  in 0,1,2,3 hours respectively. The level of lipid in muscle treated with turmeric  $95.80 \pm 8.75$ ,  $87.07 \pm 8.31$ ,  $75.7025 \pm 2.60$ ,  $66.49 \pm 2.25$  in 0,1,2,3 hours respectively. The level of carbohydrate in muscle treated with turmeric were  $90.21 \pm 6.72$ ,  $76.65 \pm 4.33$ ,  $67.14 \pm 1.77$ ,  $59.33 \pm 4.92$  in 0,1,2,3 hours respectively.

## CONCLUSION:

The results of this study exhibited that marination time and type of marinade (turmeric) significantly affect the biochemical composition of muscle tissues in Gallus gallus. Turmeric 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, especially beyond 2 hours. 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.

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