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COMPARISON IN CONCENTRATION OF CARBOHYDRATE, PROTEIN AND LIPID IN MUSCLE TISSUES OF *GALLUS GALLUS* TREATED WITH MUSTARD OIL AT DIFFERENT TIME INTERVAL

Nibedita Mohapatra*

P. G. Department of Zoology, Fakir Mohan University, Nuapadhi, Balasore, Odisha, 756020 India. *Corresponding Author

ABSTRACT The muscle tissues of chicken were collected freshly from the local market of Remuna. Then the tissues were brought by wrapping with an aluminum foil in an ice filled container to the laboratory of Fakir Mohan University. Then the fresh muscle pieces were marinated with mustard oil 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 mustard oil were 152.38±26.30, 142.89±27.28, 135.64±26.07, 105.96±14.22 in 0h,1h,2h and 3 hours respectively. The level of lipid in muscle treated with mustard oil 77.22±4.40, 86.84±3.99, 94.97±1.80, 107.4±5.88 in 0h,1h,2h and 3 hours respectively. The level of carbohydrate in muscle treated with mustard oil were 80.92±4.93, 74.48±2.60, 68.84±4.93, 60.11±5.25 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, Mustared Oil

INTRODUCTION

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). 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). A number of bioactive substances, including glutathione and serine, are also present in poultry flesh, and proper nutrition can raise the amount of most of them. Poultry flesh appears to be a viable functional food from a future standpoint. Since chicken meat is more commonly consumed than any other food animal, it serves as a major source of protein for people all over the world. Easy preparation, consistent quality, and a large selection of pre-packaged, branded, raw, and ready-to-eat and serve products are the hallmarks of chicken meat (Shedeed, 1999). Chicken meat is typically employed due to its high output, low shrinkage during heating, convenience of preparation and serving, and affordability (Branscheid, 1993).

The marinating stage of the meat is processed by which slaughtered animal muscles turn into meat and develop the textural characteristics demanded by consumers up to certain level of transformation takes place during storage for the meat to mature. The transformation process can also be accelerated by using different processes especially marinating. The marinating properties can improve the sensory and textural properties of meat. In the marinating process marinade components prepared in different forms are used. Generally different combination of agents such as salt, fruits, vegetables, organic acid, and various beverages are preferred in marinades. The marinating process improves the water holding capacity, color, taste, aroma and textural properties of the meat. Marination is a crucial step in meat processing, transforming post-slaughter muscle into meat with the desired texture and flavor. This transformation, essential for meat maturation, can be accelerated through marination, which enhances sensory and textural qualities (Goli *et al*., 2014).

The present work is to estimate the different biochemical parameters of muscle tissue of *Gallus gallus* after marinate with mustard oil. It has been observed that the level of protein and carbohydrate were decreased in comparison to control after treated with mustard oil. 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.

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 and protein concentration in muscle of *Gallus gallus*, which is treated with mustard oil showed time independent variations in the concentration of protein, lipid and carbohydrate.

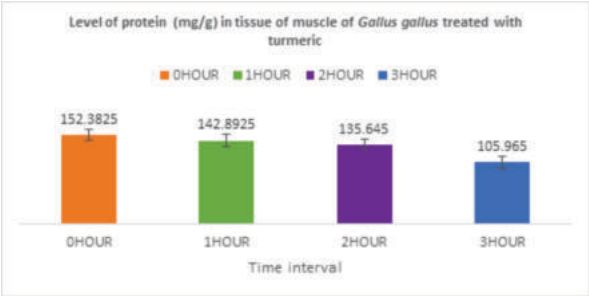

Fig -1: Level of protein (mg/g) in tissue of muscle of *Gallus gallus* treated with mustard oil

All 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 in muscle treated with mustard oil were 152.38±26.30, 142.89±27.28, 135.64±26.07, 105.96±14.22 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, mustard oil treated samples exhibited a gradual reduction in lipid concentration with increasing marination time. The increase is statistically significant ($p<0.05$), particularly between 0 hour and 3-hour intervals. This may be due to the activity of mustard oil, which increases lipid deposition. The level

of lipid in muscle treated with mustard oil were 77.22±4.40, 86.84±3.99, 94.97±1.80, 107.4±5.88 in 0h,1h,2h and 3 hours respectively. The level of lipid is lowest at control and it then gradually increases at 1h,2h and 3 hours respectively. In case of carbohydrate, the treatment exhibited a decreasing trend with time in muscle tissues. mustard oil 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 mustard oil were 80.92±4.93, 74.48±2.60, 68.84±4.93, 60.11±5.25 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.

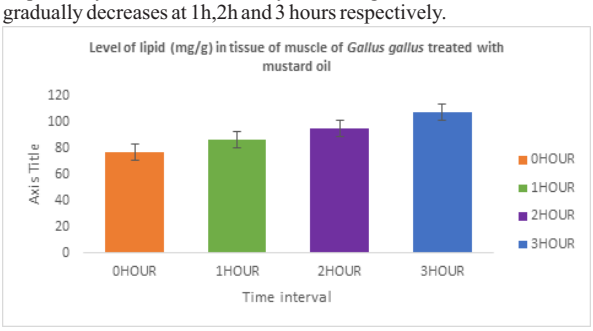

Fig -2: Level of lipid (mg/g) in tissue of muscle of *Gallus gallus* treated with mustard oil

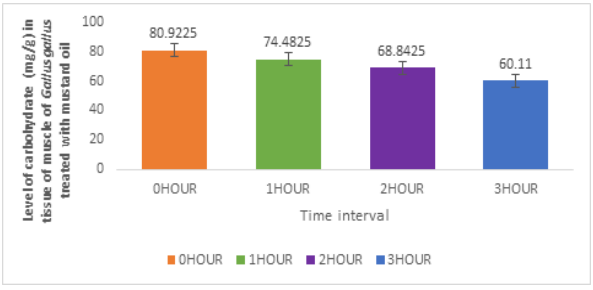

Fig-3: Level of carbohydrate (mg/g) in tissue of muscle of *Gallus gallus* treated with mustard oil

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. 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 study was performed to evaluate te quality and self-life of broiler meat incorporated wit soyaben, mustard oil and flax seed oil. Here meat samples were divided into four different groups and they were divided into four different groups and they were given different controls. After 0,7,14 days of storage samples were taken for tested. like pH, holding capacity, sensory properties, oxidative stability. when control groups were compared with the groups which were supplied with oil exhibited effect on physiochemical properties, oxidative stability, sensory quality. During the entire storage process the pH and water holding capacity of all oil containing groups were lower than the control group. Among all the treatment batches, the mustard oil had lower oxidative stability. So, mustard oil could be used as a preservative of raw broiler meat at refrigerated storage. (Hasem *et al*., 2022).

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

CONCLUSION:

The results of this study exhibited that marination time and type of marinade (mustard oil) significantly affect the biochemical composition of muscle tissues in *Gallus gallus*. mustard oil 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 mustard oil marination the concentration of protein and carbohydrate decreased whether the concentration of lipid increased. The decline in protein and carbohydrate may be due to breakdown of the macromolecules during the marination process. The rise in the lipid concentration may be due to the absorption of mustard oil by the liver and muscle tissue due to prolonged time marination.

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