A production report on investigation of Beef quality from super shop and retail market in Chattogram, Bangladesh

A production report submitted by

Md. Omar Faroque

Intern Id: 16

Roll No. 16/18

Reg. No. 01626

Session: 2015-2016

Report presented in partial fulfilment for the degree of

Doctor of Veterinary Medicine (DVM)

Faculty of Veterinary Medicine

Chattogram Veterinary and Animal Sciences University.

Khulsi, Chattagram-4225

A production report on investigation of Beef quality from super shop and retail market in Chattogram, Bangladesh

A production report submitted as per approved by style and content.

_____   _____
Signature of the Author   **Signature of the Supervisor**

Md. Omar Faroque	**DR. Kona Adhikary**
Intern id: 16	Assistant Professor
Roll No. 16/18	Department of Animal Science and Nutrition
Reg. No. 01626	
Session: 2015-2016	Chattogram Veterinary and Animal Sciences University
Chattogram Veterinary and Animal Sciences University	Khulsi, Chattogram-4225
Khulsi, Chattogram-4225	

Content

Title	Page number
Content	3
List of graphs	4
Elaboration of all aberration	4
Abstract	5
Introduction	6-7
Methods and materials	8-9
Results and discussions	10-12
Limitations	13
Conclutation	13
References	14
Acknowledgement	15
Biography	15

List of graphs

Elaboration of all Abbreviation

Abbreviation	Elaboration
Et all	And his associate
pH	Potential of Hydrogen
WHC	Water Holding Capacity
ERV	Extract Release Volume
CVASU	Chattogram Veterinary and Animal Sciences University

Abstract

10 beef samples were collected from super shops and retail markets in Chattogram, Bangladesh to investigate hygienic measurement of beef. From these 10 samples of beef we estimate pH, Water Holding Capacity(WHC), Extract Release Volume(ERV). For these purposes, we measure pH by pH meter(ORION STAR A211 model,made in Indonesia), WHC by compression method and ERV through filter paper. The pH range is between 5.38 - 6.42. The average pH is 5.69. The range of water holding capacity is between 3.46 - 21.63 cm square .The average value of WHC is 9.08 cm square. The range of minimum and maximum value of Extract release volume is 15 - 26 ml . The average value of Extract release volume is 20.95 ml. All the data analysed by Excel.

Introduction

Bangladesh is an agricultural country. Almost 40.6% people are engaged with the agricultural sector. About 13.47% Of total GDP comes from the agricultural sector , from which 1.43% comes from the livestock sector (Economic review- 2021). Bangladesh is one of the highest densely populated countries (1140 per square km) of the world having a population of 168.2 million people within the area of 1,47,570 square km (SVRS Report-2020). According to Economic Review- 2021 , The per capita income is 2226 USD, which will become 5700 USD within 2030 and more than 12000 USD within 2041. Being a lucrative venture, there have been many dairy and poultry industries established in our country over the last year. As socio-economis status is changing day by day , People want to eat more pure and hygienic food. As meat is the main source of protein in our daily eating habits , it must be hygienic . But, there are a lot of chances of pollution of meat during slaughtering of animals which will make meat unhygienic. But, there are less studies about Meat quality. That's why we made an investigation of beef quality from super shops and retail markets in Chittagong.Red meat has been a greater part of our diet. Beef is red meat , when raw, is red; as it contains a higher percentage of myoglobin. It provides a lot of high biological value of protein , essential nutrients like vitamins, minerals etc. Red meat contains 20-24 g protein per 100 gm when it is raw . Red meat contains vitamin A, B1, B2, B3, B6, B12, Iron , Zinc , Phosphorus , Magnesium etc (Wyness, et al., 2016). For this study we take different parameters of meat like pH, Water Holding capacity(WHC),Extract release volume(ERS) to justify the quality of meat.

pH is a numeric expression of the amount of acid (usually lactic acid in meats) present in a solution or product and is actually the negative logarithm of the hydrogen ion concentration expressed on a 0 to 14 scale with 7.0 being neutral.Changes in meat pH result from post mortem metabolism (glycolysis) and the conversion of glycogen into lactic acid.The quality factors affected by pH include: color, grading characteristics and shrink of carcasses and wholesale cuts, texture, cooking loss, tenderness of steaks, processing and binding characteristics of comminuted and restructured meats like sausages. A range of ultimate pH values from 5.4 to 7.2 . A low ultimate pH results in meat proteins having decreased water-holding capacity and a lighter colour. Conversely, a higher ultimate pH will give a darker colour and less drip loss. Ultimate pH also impacts eating quality characteristics such as juiciness, tenderness, and taste (A Watanabe, 1996).

The ability of meat to retain the water during application of external forces, such as cutting, heating, grinding or pressing. Such forces can be exhaustive starvation and thirst, prolonged traveling on foot, extreme heat or windy air condition of the environment when the animals stay, dry or humid storage of meat, and the orientation of cutting, grinding, or processing of meat (Miller, 2007). The majority of water in meat is held within the structures of the muscle itself.
It can be found within the myofibrils, between the myofibrils and the cell membrane, between muscle cells and between muscle bundles. Once muscle is harvested, the amount of water in meat can be changed depending on numerous factors related to the tissue itself and how the

product is handled (Simela, 2005). Water held in the meat can have different names according to their location. Bound water is the water that is found within the protein of the meat. Entrapped water found within muscle structures. This water molecule may be held either by steric effects or by attraction to the bound water but is not bound per se to protein. In early postmortem tissue, this water does not flow freely from the tissue, yet it can be removed by drying, and can be easily converted to ice during freezing. Entrapped or immobilized water is most affected by the rigor process and the conversion of muscle to meat. Upon alteration of muscle cell structure and lowering of the pH, this water can also eventually escape as wash out. Maintaining as much of this water as possible in meat is the goal of meat handlers (Huff-Lonergan, 2005). Many pre and post-mortem factors are related while counting the water holding capacity like genetic factors, breed, feed quality. Pre-slaughter stress , different methods of stunning method may also affect water holding capacity. In the post-slaughter period , chilling ,ageing, and injecting non-meat ingredients may also influence water holding capacity. (Qiaofen Cheng , 2008).When the tissues have poor water holding properties, the loss of moisture and, Consequently, the loss of weight during storage is great.Water holding capacity is also especially important in the meat ingredients of manufactured products that are subjected to heating, grinding and other processes.

Extract release volume is the volume of aqueous extract released by homogenate of meat (Meat: extractive solution in 1: 4 ratio), when allowed to pass through a filter paper for a given period of time. The Extract release volume(ERV)is reportedly identified as an indicator of presence of microbes in meat (LInda sue miller). Bacterial spoilage of meat is done by microorganisms, which makes changes in muscle structures The objective to determine Extract release volume(ERV) is to predict microbial quality of meat and detect spoilage and putrefaction of meat.Extract release volume is inversely proportional to the extent of spoilage of meat. Extract release volume decreases with progress of spoilage and low filtrate will be detected in putrid meat.

Hope this study will give a very clear concept about hygienic measurement of beef (super shops and Retail markets) which helps to give an idea about hygienic status of beef in chattogram , bangladesh.

Objectives of the study :
- To know about the overall quality of beef in retail markets and super shops
- To know about the microbial load of meat
- To know about the hygienic condition of meat
- To get an idea of pre-slaughtering treatment of animals

Materials and Methods

Study area: Different super shops and retail markets in Chittagong ,Bangladesh .

Study period: The study is carried out within 4 -5 october , 2021 at department of Animal science and Nutrition (CVASU).

Collection of sample: Beef has been collected from 5 super shops and 5 retail markets in Chittagong, Bangladesh .

Karnaphuli Market

Jhawtola Market

Basket

Khulshi Mart

Lab Examination:

- **pH:** pH is estimated by pH Meter (ORION STAR A211 model,made in Indonesia)

- **Water holding capacity :**The ability of meat to retain the water during application of external forces, such as cutting, heating, grinding or pressing. water holding capacity estimated by Compression Test by Whatman no. 41 filter paper.

Procedure:

300 mg of the given meat sample was placed on a whatman no. 41 filter paper and the filter paper was placed between two glass slides. On the top of the upper glass slide a 100 gm weight was placed. This arrangement is kept on a hard top plate for 3 minutes. The released water from the meat sample was absorbed in the filter paper and left an impression. With a sharp pencil the boundary of the impression was carefully demarcated.The area was measured by using compensating polar planimeters (square centimeters).

- **Extract release volume:** Extract release volume is the volume of aqueous extract released by homogenate of meat (Meat: extractive solution in 1: 4 ratio), when allowed to pass through a filter paper for a given period of time.

Procedure:

Fifteen grams of meat was blended for 2 minutes with 60 ml of extraction reagent in a mixer / homogenizer. The blended contents were transferred to a glass funnel (10 cm diameter) with a Whatman No. 1 filter paper (18.5 cm diameter) folded thrice so as to make eight sections and the filtrate was collected in a 100 ml capacity measuring cylinder. The quantity of filtrate obtained in 15 minutes at room temperature and was reported as milliliters of extract release volume of the meat sample.

Statistical Analysis : All the data has been analyzed in Excel. while analyzed 95% significance level is accepted.

Result and Discussions

pH Measurement:

We collected 10 samples from super shops and retail markets. After collecting meat, we estimate the pH of meat. The pH of 10 samples of meat is shown in graph-1. The range of minimum and maximum of pH is 5.38 - 6.42. M Abril et al(2001) studied pH in male cattle which ranged from 5.17 - 7.10. Average incidence of pH in beef is 5.8 - 6(Nuria Mach,2008).We estimated the average value of meat pH is 5.69 which is quite similar with different studies. .The standard deviation of pH is 0.327.


pH Measurement

	1	2	3	4	5	6	7	8	9	10
Series1	6.42	5.38	5.97	5.68	5.58	5.43	5.42	5.77	5.42	5.84

Sample Number
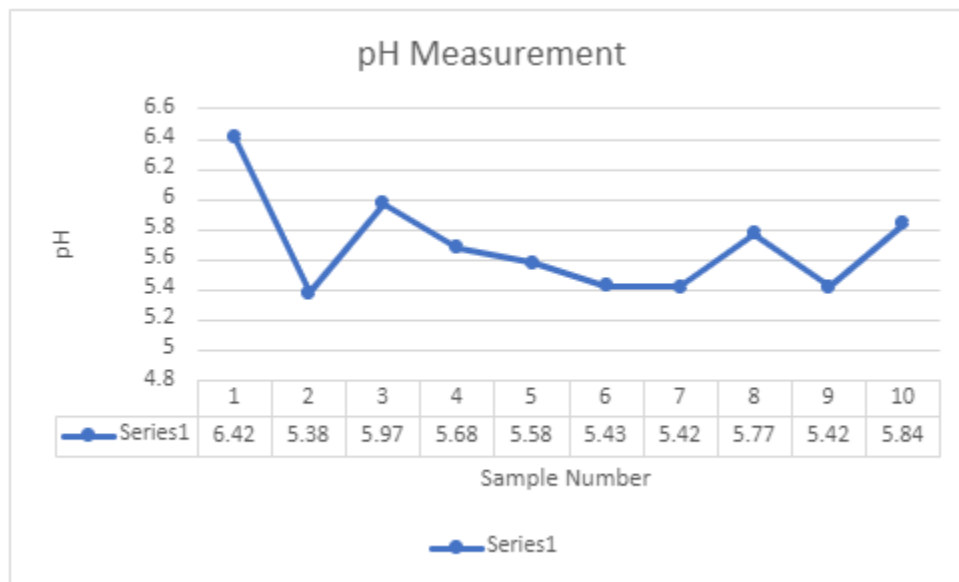
Water Holding Capacity:

After collecting 10 samples from super shops and retail markets, we estimate water Holding Capacity of Beef. The value of Water Holding capacity of beef is shown in Graph-2. The range of minimum and maximum value of Water Holding capacity is 3.46 - 21.63 cm square .The average value of WHC is 9.08 cm square. The standard deviation value of WHC is 7.61. While estimating the WHC we used two types of filter paper , that's why the result is not uniform at all and standard deviation of the result is also high.

Water Holding Capacity

Sample Number	1	2	3	4	5	6	7	8	9	10
Series1	9.08	5.4	16.6	21.23	14.53	6.42	6.15	5.72	4.71	3.46
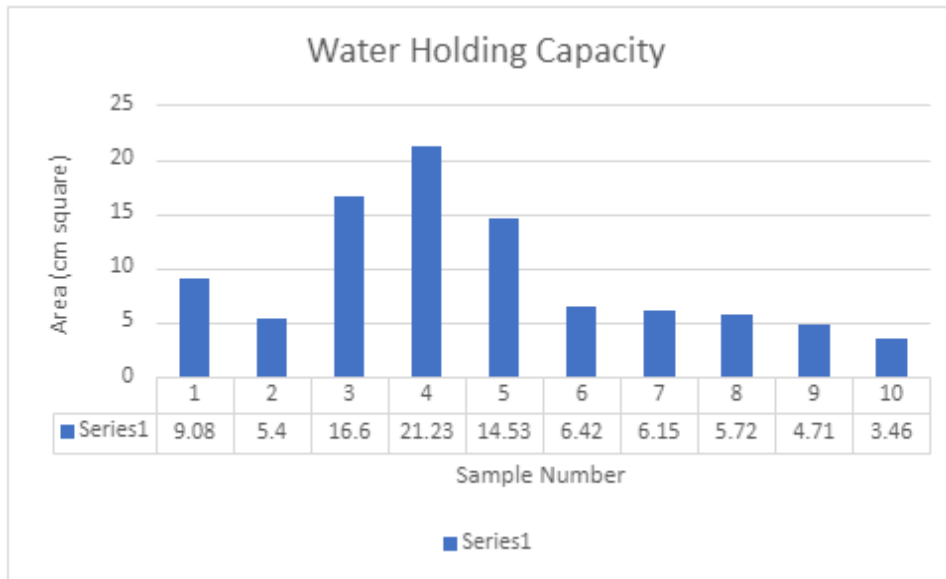
Extract Release Volume:

After collecting 10 samples from super shops and retail markets, we estimate the Extract Release volume(ERV) of beef.The ERV value of 10 samples is shown in the graph -3. The range of minimum and maximum value of ERV is 15 - 26 ml . According to (Jay, James M.) ERV dropped from an initial of 30 to 5 over a 6-day period, which is quite similar to our calculated result. The average value of ERV is 20.95 . The standard deviation value of ERV is 3.54.

Extract Release Volume

	1	2	3	4	5	6	7	8	9	10
Series1	25.25	22	18	23	26	19	18	15	23	20

Sample Number
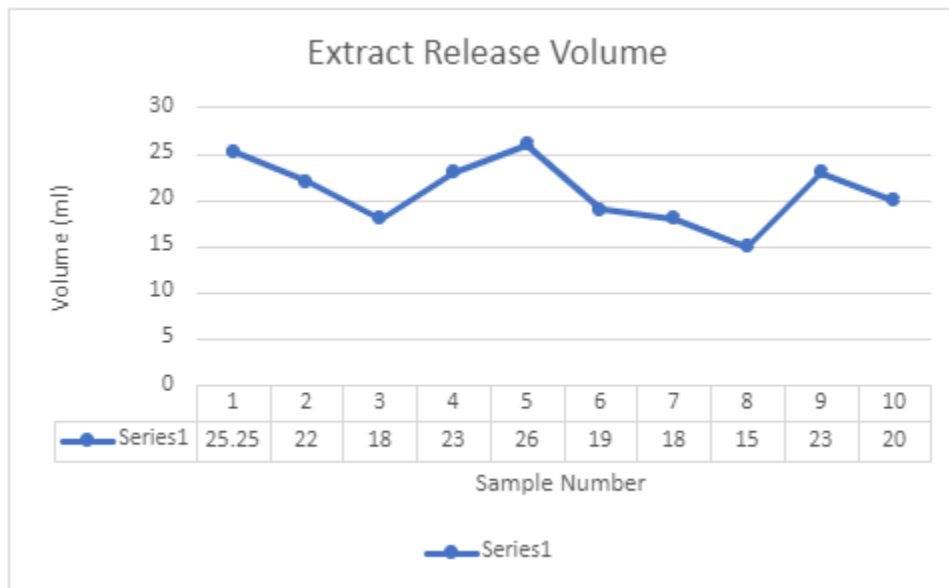
Limitations

Some limitations we faced during the collecting the meat sample and during testing.

- Water holding capacity cannot be estimated by the same filter paper , that's why the result is not uniform and standard deviation is more.
- Not all samples were collected on the same day .
- Different samples are tested at different times so results might be somewhat less accurate.
- This study is only about pH, WHC, ERV and no microbial study is done , so it cannot give a proper idea about meat investigation.

Conclusions

This study is based on general investigating criteria like pH, WHC, ERV of meat in Chattogram, Bangladesh. 4 out of 10 samples are not in the range of the ultimate pH sample. it might be sold after 24 hour of slaughter. 4 out of 10 samples give less value than the average value of extract release volume. 3 out of 10 samples gives a higher water holding capacity than the normal range.

References

WYNESS, LAURA, (2016) The role of red meat in the diet: nutrition and health benefits

A watanbae et al(1996), The effects of ultimate pH of meat om tenderness changes during ageing

Brondum J et al (2000). Prediction of water-holding capacity and composition of porcine meat by comparative spectroscopy.

Q Cheng (2008) , Factors affect water holding capacity of red meat products

Linda sue miller , Relationship of extract release volume and reduction of resazurin and tetrazolium dyes to microbial contamination in pork

M abril et al (2001), Beef color evaluation as a function of ultimate pH

N. Mach et al(2008), Association between animal , slaughterhouse , transportation and meat pH in beef

Jay, James M (1965), Response of the extract release volume and water holding capacity phenomena to microbiologically spoiled beef and aged meat

Miller M (2007). Dark, firm and dry beef. Beef Facts-Product Enhancements

Simela L (2005). Determination of meat quality, University of Pretoria, etd. Literature review: 4-44.

Huff-Lonergan E, Lonergan SM (2005). Mechanisms of water-holding capacity of meat: The role of postmortem biochemical and structural changes. Meat Sci. 71(1):194-204.

Zhang YY, Zan LS, Wang HB, Xin YP, Adoligbe CM, Ujan JA (2010). Effect of sex on meat quality characteristics of Qinchuan cattle. Afr. J. Biotechnol. 9(28):4504-4509

Economic Review-2021

SVRS Report-2020

Acknowledgement

All praises are due to the Almighty, whose blessings have enabled the author to accomplish this work.The author expresses his wholehearted senses of gratification, a sincere appreciation to his respected teacher and supervisor **Dr.Kona Adhikary ,** Assistant Professor, Department of Animal Science and Nutrition, Chattogram Veterinary and Animal Sciences University, whose ingenuous and scholastic advice, judicious recommendations, constructive criticism, continuous encouragement and untiring assistance have guided the author from the beginning of inception of intern studies until to the completion of this report. The author also thanked the butcher and super shops who gave samples for test purposes.

Biography

I am **Md. Omar Faroque** , son of Md. Abul Kasem and Farida Yesmin. I have passed my Secondary School Certificate (SSC) examination from Kutubdia Model High School, Cox's Bazar in 2012 and Higher Secondary Certificate (HSC) examination from Govt. City College, Chattogram in 2014. I enrolled for a Doctor of Veterinary Medicine (DVM) degree in Chattogram Veterinary and Animal Sciences University (CVASU) Bangladesh during the 2015-16 session. I have immense interest in joining the Bangladesh Civil Service(BCS).