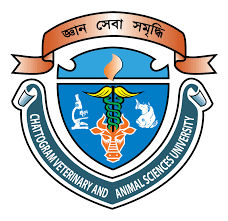
****

**Nutrient Composition of Locally Available Chicken and Duck Egg Powder**

**Waichingnu Chowdhury**

Roll No.: 0118/11

Registration No.: 00553

Session: July- December 2019

**A thesis submitted in the partial fulfillment of the requirements for the degree of Master of Science in Applied Human Nutrition and Dietetics**

**Department of Applied Food Science and Nutrition**

**Faculty of Food Science and Technology**

**Chattogram Veterinary and Animal Sciences University**

**Chattogram-4225, Bangladesh**

**DECEMBER 2019**

**Authorization**

I hereby declare that I am the sole author of the thesis. I also authorize the Chattagram Veterinary and Animal Sciences University (CVASU) to lend this thesis to other institutions or individuals for the purpose of scholarly research.

I further authorize the CVASU to reproduce the thesis by photocopying or by other means, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research.

I, the undersigned, and author of this work, declare that the **electronic copy** of this thesis provided to the CVASU Library, is an accurate copy of the print thesis submitted, within the limits of the technology available.

**Waichingnu Chowdhury**

**DECEMBER 2019**

**Nutrient Composition of Locally Available Chicken and Duck Egg Powder**

**Waichingnu Chowdhury**

Roll No.: 0118/11

Registration No.: 553

Session: July- December 2019

**This is to certify that we have examined the above Master’s thesis and have found that is complete and satisfactory in all respects, and that all revisions required by the thesis examination committee have been made.**

**…………………………………………………………….**

**Prof. Dr. S.K.M. Azizul Islam**

**Supervisor**

**Dept. of Physiology, Biochemistry and Pharmacology**

**Chattogram Veterinary and Animal Sciences University**

…………………………………………….

**Md. Altaf Hossain**

**Chairman of the Examination Committee**

**DEPARTMENT of Applied Food Science and Nutrition**

**Faculty of Food Science & Technology**

**Department of Applied Food Science and Nutrition**

**Faculty of Food Science and Technology**

**Chattogram Veterinary and Animal Sciences University**

**Chattogram-4225, Bangladesh**

**DECEMBER 2019**

|  |
| --- |
| DEDICATED TO MY RESPECTED AND BELOVED FAMILY AND TEACHERS |

**Acknowledgements**

I would like to express my thanks and grateful feelings for everyone that have helped and supported me in various ways during my degree of Master of Science in Applied Human Nutrition and Dietetics under the Department of Applied Food Science and Nutrition, Chattogram Veterinary and Animal Sciences University. Completion of a master degree is not an easy task for me, and I cannot image myself getting this far without everyone’s help and support.

First of all, I would like to thank my supervisor **Prof. Dr. S.K.M. Azizul Islam** Dept. of Physiology, Biochemistry and Pharmacology**,** Chattogram Veterinary and Animal Sciences University for his supervision and guidance in successful completion of this work. He is also funny and has a lot of stories. But when talking about research, he is a little bit of tough and really has a high standard and is not easy to be persuaded. Thanks to his serious attitude about research, I become a better researcher and learned the ability of critical thinking, problem solving, and trouble shooting and am more confident to face any difficult tasks that may confront me in the future.

Second, I feel much pleasure to convey my profound gratitude to my teacher **Md. Altaf Hossain**, Head, Department of Applied Food Science and Nutrition for his valuable suggestions and inspiration. It is my privilege to acknowledge, **Prof. Dr. Ashraf Ali Biswas**, Department of Animal Science and Nutrition, CVASU, for his support and suggestions on my research. It really helped a lot.

Third, I sincerely thank to all members of department of Applied Food Science and Nutrition, Food Processing and Engineering, Poultry Research and Training Center (PRTC) and Department of Physiology, Biochemistry and Pharmacology, for their constant inspiration and kind co-operation in performing the research activities precisely.

Fourth, I would like to thank all lab members and other undergraduate and graduate students in the department. Thanks for their help on the method development, equipment operation, and data analysis. I feel so lucky to be working with this group of people who are fun, creative, and nice, which makes my master degree much easier and much less miserable.

Last but not least, I would like to thank my family and friends who supported me through all my way. There have been happy times and tough times and I am very grateful that they are always there so that I know I am not alone. With their support and help, I am stronger and braver to conquer any projects and solve any problems in the past, now, and future.

**The author**

**December 2019**

|  |  |  |
| --- | --- | --- |
| **Chapter** | **Contents** | **Page** |

|  |  |  |
| --- | --- | --- |
|  | **Authorization …………………………………………………** | ii |
|  | **Acknowledgements ………………………………………….** | v |
|  | **List of Tables …………………………………………………** | xi |
|  | **List of Figures ………………………………………………..** | xii |
|  | **List of Abbreviations …………………………………………** | xiii |
|  | **Abstract ………………………………………………………** | xiv |
| **Chapter I** | **Introduction……………………………………………………** | 1 |
| **Chapter II** | **Review of Literature …………………………………………** | 3 |
|  | 2.1 Different types of egg products composition………… | 4 |
|  | 2.2 Vitamins of egg ……………………………………… | 5 |
|  | 2.3 Minerals of egg……………………………………… | 6 |
|  | 2.4 Egg White…………………………………………… | 6 |
|  | 2.4.1 Ovalbumin……………………………………… | 7 |
|  | 2.4.2 Conalbumin……………………………………… | 7 |
|  | 2.4.3 Ovamucoid……………………………………….. | 7 |
|  | 2.4.4 Ovomucin………………………………………... | 8 |
|  | 2.4.5 Lysozyme…………………………………………. | 8 |
|  | 2.4.6 Avidin…………………………………………… | 8 |
|  | 2.4.7 Ovoglobulin……………………………………… | 8 |
|  | 2.4.8 Ovoinhibitor ........………………………………… | 8 |
|  | 2.5 Egg Yolk………...…………………………………… | 9 |
|  | 2.6 Production status of egg……….……………………….. | 10 |
|  | 2.7 Powdered egg………………………………………….. | 11 |
|  | 2.7.1 Production of egg powders: types and process… | 12 |
|  | 2.7.2 Type of egg powders……………………………... | 12 |
|  | 2.7.2.1 Dried egg white……………………………. | 12 |
|  | 2.7.2.2 Dried whole egg and egg yolk…………….. | 12 |
|  | 2.7.3 Special dried egg products……………………... | 13 |
|  | 2.7.3.1 Lysozyme-free egg white………………… | 13 |
|  | 2.7.3.2 Low cholesterol egg products……………… | 13 |
|  | 2.8 Drying methods for egg powder production ……....… | 13 |
|  | 2.8.1 Spray drying…………………………………….. | 13 |
|  | 2.8.2 Pan drying………………………………………. | 14 |
|  | 2.8.3 Freeze drying…………………………………… | 14 |
|  | 2.8.4 Foam-mat drying………………………………... | 14 |
|  | 2.9 Applications in the food and beverage industries…… | 15 |
|  | 2.9.1 Confectionary………………………………… | 15 |
|  | 2.9.2 Meat and fish products…………………………. | 15 |
|  | 2.9.3 Bakery………………..………………………… | 15 |
|  | 2.9.4 Desserts……………………………………….. | 16 |
|  | 2.9.5 Mayonnaise, salad dressing and sauces……… | 16 |
|  | 2.9.6 Pasta…....……………………………………... | 16 |
|  | 2.9.7 Dietary food…………...……………………... | 16 |
|  | 2.9.8 Beverages……………………………………... | 17 |
|  | 2.10 Conclusion………………………………………… | 17 |
| **Chapter III** | **Materials and Methods………………………………………...** | 18 |
|  | 3.1 Egg collection and sample preparation……………….. | 18 |
|  | 3.1.1 Collection of eggs………………………………… | 18 |
|  | 3.1.2 Samples preparation for nutritional compositionAnalysis…………………………………………… | 18 |
|  | 3.2 Chemical analysis of egg powder……………………... | 20 |
|  | 3.2.1 Determination of moisture content……………….. | 20 |
|  | 3.2.2 Determination of ash content…………………….. | 20 |
|  | 3.2.3 Protein determination…………………………….. | 21 |
|  | 3.2.4 Crude fat determination………………………… | 22 |
|  | 3.2.5 Crude Fiber Determination……………………… | 23 |
|  | 3.2.6 Determination of total carbohydrates…………… | 24 |
|  | 3.3 Determination of mineral content……………………… | 24 |
|  | 3.3.1 Determination of Calcium (Ca++) ……………… | 25 |
|  | 3.3.2 Determination of magnesium (Mg)……………… | 25 |
|  | 3.3.3 Determination of phosphorus (P)………………… | 26 |
|  | 3.3.4 Determination of Potassium (K+)………………… | 26 |
|  | 3.3.5 Determination of Chloride Ion (Cl-)……………… | 26 |
|  | 3.3.6 Determination of Iron (Fe)……………………… | 27 |
|  | 3.3.7 Determination of Vitamin E……………………… | 27 |
| **Chapter IV** | **Result………………..………………………………………….** | 29 |
|  | 4.1 Overall weight distribution of different types of poultryEggs…………………………………………………….. | 29 |
|  | 4.2 Nutritional composition of different types of poultryEgg……………………………………………………… | 30 |
|  | 4.2.1 Nutritional composition of commercial layerchicken egg………………………………………… | 30 |
|  | 4.2.2 Nutritional composition of Native chicken egg(Deshi)…………………………………………….. | 30 |
|  | 4.2.3 Nutritional composition of Duck egg…………… | 31 |
|  | 4.3 Mineral composition of different types of poultry egg… | 32 |
|  | 4.4 Vitamin E in different poultry egg yolk……………… | 33 |
| **Chapter V** | **Discussion ……………………………………………………** | 34 |
| **Chapter VI** | **Conclusion ……………………………………………………** | 37 |
| **Chapter VII** | **Strength & weakness……………………………………….** | **38** |
|  | 6.1 strength of the study……………………………………. | 38 |
|  | 6.2 weakness of the study………………………………….. | 38 |
| **Chapter VIII** | **Recommendation ……………………………………………** | 39 |
|  | **References …………………………………………………..** | 40 |
|  | **Appendices ………………………………………………….** | 49 |
|  | **Brief biography ……………………………………………...** | 50 |

|  |
| --- |
| **List of Tables** |

|  |  |  |
| --- | --- | --- |
| **Table 2.1** | Nutritional composition of egg white and Yolk | 4 |
| **Table 2.2** | Egg composition | 4 |
| **Table 2.3** | Egg vitamins | 5 |
| **Table 2.4** | Egg minerals | 6 |
| **Table 2.5** | Composition and physicochemical properties of the major  egg white proteins | 7 |
| **Table 2.6** | Amount of proteins in hen and duck egg white (%) | 9 |
| **Table 2.7** | Composition of hen egg yolk | 10 |
| **Table 2.8** | Approximate egg yolk composition of duck egg | 10 |
| **Table 2.9** | Demand, production, availability and deficiency of milk, meat and eggs(2017-18) | 13 |
| **Table 3.1** | Calcium (Ca++) determination | 28 |
| **Table 3.2** | Magnesium (Mg) determination | 28 |
| **Table 3.3** | Phosphorus (P) determination | 29 |
| **Table 3.4** | Potassium (K+) determination | 29 |
| **Table 3.5** | Chloride ion (Cl-) determination | 30 |
| **Table 3.6** | Iron (Fe) determination | 30 |
| **Table 4.1** | overall weight distribution of layer, native and duck egg | 32 |
| **Table 4.2** | mineral composition of layer, native and duck egg | 35 |
| **Table 4.3** | Vitamin E content | 36 |

|  |
| --- |
| **List of Figures** |

|  |  |  |
| --- | --- | --- |
| **Figure 2.1** | Egg composition | 3 |
| **Figure 3.1** | Flow sheet for egg powder production | 21 |
| **Figure 3.2** | Protein determination | 25 |
| **Figure 3.3** | Minerals determination | 27 |
| **Figure 4.1** | Chemical analysis of commercial layer egg | 33 |
| **Figure 4.2** | Chemical analysis of Native egg | 34 |
| **Figure 4.3** | Chemical analysis of Duck egg | 34 |

**Abbreviations**

% Percentage

AC Ash content

ANOVA Analysis of variance

AOAC Association of Official Analytical Chemists

BBS Bangladesh Bureau of Statistics

℃ Degree Celsius

CF Crude fiber

CHO Carbohydrate

CP Crude protein

DHA Docosahexaenoic Acid

DM Dry matter

EPA [Eicosapentaenoic Acid](https://en.wikipedia.org/wiki/Eicosapentaenoic_acid)

et al Et alii/ et aliae/ et alia

etc Et cetera

FAO Food and Agricultural Organization

HCl Hydrochloric Acid

HNO3 Nitric Acid

IEP Isoelectric Point

kDa Kilodaltons

MC Moisture content

mg Mili Gram

NEM Natural Eggshell Membrane

NGOs Non-Governmental Organization

SEM Standard Error of Mean

SPSS Statistical Package for Social Science

**Abstract**

The eggs have been recommended as one of the best source of a complete food. Dehydration is a good process for food preservation. The aim of the present study were to measure the overall weight and nutritional composition of different poultry eggs powder (native chicken (Deshi) egg, commercial layer chicken (Hybrid) egg and duck egg). Eggs were collected from the local kitchen markets dried and subjected to nutritional assessment. Descriptive statistics including percentage, mean and standard deviation were performed. One way analysis of variance (ANOVA) was performed to find out the level of significance at P <0.05. Duck egg had both higher weight and yolk content compared to other two different types of poultry egg. On the other hand, native chicken egg had lower weight but contained almost same proportion of egg white (albumen) and egg yolk. However, commercial layer chicken egg contained higher albumen portion that’s why we got higher dried albumen weight. In case of, nutritional component of albumen, native chicken eggs had the highest protein (84.58%), duck (81.84%) and commercial layer chicken (81.43%), respectively. But, in yolk, duck egg had higher protein (38.5%) as compared to layer chicken egg (36.52%) and native chicken egg (36.16%), consecutively. Moreover, the fats content in albumen part ranges from 0 to 0.15% whereas yolk portion had (36.16% – 38.50%) of the different poultry. The albumen of different poultry eggs were contained higher moisture than the yolk.Yet, the carbohydrates percentage of yolk portion found higher (1.28% to 4.44%)compared to white (0.61% to 4.43%). Native chicken egg white had higher Calcium (Ca) (2.87mg/gm), Magnesium (Mg) (1.30mg/gm), Phosphorus (P) (6.26mg/gm) and Potassium (K) (2.48mg/gm) compared to other two types of poultry eggs. In yolk, native chicken egg also had higher Mg (0.62mg/mg), P (17.78mg/mg) and K (4.28mg/mg) accordingly. In summary, we found duck egg had higher weight than others. In dried condition, native egg albumen contained the highest nutrient component while in dried yolk, these components were found the highest in commercial layer chicken egg.

**Keywords:** Egg powder, egg albumen, egg yolk, native egg (Deshi).