



**Preparation of Guava (*Psidium Guajava*) Jelly with
Ethanollic Leaf Extracts and Assesment of its
Nutritive Value, Shelf Life and Antimicrobial
Efficacy Against *Escherichia Coli***

Shymoon Nahar Khanam

Roll no: 0119/16

Registration no: 674

Session: 2019-2020

**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**

JUNE 2021

Authorization

I hereby state that I am the only author of the thesis. I also authorize the Chattogram 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, announce 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.

Shymoon Nahar Khanam

JUNE 2021

**Preparation of Guava (*Psidium guajava*) Jelly with
Ethanollic Leaf Extract and Assesment of its Nutritive
Value, Shelf Life and Antimicrobial Efficacy against
*Escherichia coli***

Shymoon Nahar Khanam

Roll no: 0119/16

Registration no: 674

Session: 2019-2020

**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**

.....
Dr. A.K.M. Saifuddin
Supervisor
Professor

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

.....
Dr. S.K.M. Azizul Islam
Co-Supervisor
Professor

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

.....
Ms. Kazi Nazira Sharmin

Associate Professor

(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

June 2021

DEDICATED TO MY
RESPECTED AND BELOVED
PARENTS AND TEACHERS

Acknowledgements

First and foremost, I would like to express my gratitude to “**Omnipotent the Allah**” from my deepest sense of gratitude, whose blessing has enabled me to complete the thesis for the degree of Masters of Science (MS) in Applied Human Nutrition and Dietetics.

I express my sincere and deepest gratitude to supervisor, **Prof. Dr. A.K.M. Saifuddin**, Dept. of Physiology, Biochemistry and Pharmacology, Chattogram Veterinary and Animal Sciences University for his effective guidance during my whole study period. I also offer my special gratitude and heartfelt thanks to my co-supervisor **Prof. Dr. S.K.M. Azizul Islam**, Dept. of Physiology, Biochemistry and Pharmacology, Chattogram Veterinary and Animal Sciences University, for his guiding support and wholehearted cooperation during my research work. He is the jolliest and most friendly teacher I have ever encountered. Thanks to his serious attitude about my research, I am more confident to face any difficult task that may confront me in the future.

I owe my special thanks to the director and the scientists associated with this research work of Poultry Research and Training Center (PRTC), Department of Applied Food Science and Nutrition, Department of Applied Chemistry and Chemical Technology, Department of Animal Science and Nutrition, Department of Food Processing and Engineering, Department of Physiology, Biochemistry and Pharmacology, CVASU for their kind co-operation in the research activities precisely in those laboratories.

I would like to convey my gratitude to **National Science and Technology (NST)** Fellowship 2019-2020 of Ministry of Science and Technology, Bangladesh and **Research and Extension** of CVASU, Bangladesh for financial help and supplies during the study period.

Finally, I must express my very profound gratitude and cordial thanks to my family, friends and well-wishers for their inspiration during the study. There have been happy times and tough times and I am grateful that they have always been there which supported me throughout the way.

The author

June 2021

Table of Contents

Acknowledgement	i
Abbreviations	vii
Abstract	viii
Chapter 1: Introduction	1
Chapter 2: Review of Literature	4
2.1 Overview of guava	4
2.1.1 Guava leaves	4
2.1.2 Origin and Taxonomy of guava.....	5
2.2 Utilization and economic importance of guava and guava leaves	5
2.2.1 Nutritional value of guava	5
2.2.2 Utilization of different part of guava	6
2.2.3 Food utilization	6
2.3 Medical and health benefit of guava and guava leaf jelly	8
2.3.1 Anti-diabetic	8
2.3.2 Anti-inflammatory activity	8
2.3.3 Anticancer effect	8
2.3.4 Antiviral Activity	8
2.3.5 Guava for Cold and Cough	9
2.3.6 Antidiarrheal activity	9
2.3.7 Healing and cytotoxic effects	10
2.3.8 Antimicrobial efficacy of guava leaves	10
2.4 Phytochemical component of guava and guava leaves	11
2.4.1 Total phenolic compounds	11
2.4.2 Antioxidant and Antioxidant activity of guava fruits and guava leaves.	11
2.4.3 Flavonoids	12
Chapter 3: Materials and Methods	14
3.1 Study Area	14
3.2 Study Duration	14
3.3 Experimental Design	14
3.4 Collection of Sample Materials	15
3.5 Guava Leaves Extract Preparation	15
3.6 Methods of Sample Preparation	16

3.7 Physicochemical Analysis of Guava Jelly	19
3.7.1 Determination of pH	20
3.7.2 Total Soluble Solids (TSS)	20
3.7.3 Titratable Acidity	20
3.7.4 Determination of Vitamin C	21
3.7.5 Moisture Content	22
3.7.6 Total Solids	22
3.7.7 Ash Content	22
3.7.8 Estimation of Crude Fat	23
3.7.9 Estimation of Crude Protein	23
3.7.10 Estimation of Crude Fiber	23
3.7.11 Determination of Total Carbohydrate	24
3.8 Determination of Antioxidant capacity by DPPH scavenging method	24
3.9 Determination of Bioactive compounds	25
3.9.1 Total Phenolic Content (TPC)	26
3.9.2 Total Flavonoid content (TFC)	26
3.10 Microbiological analysis	27
3.10.1 Aerobic plate count (Bacterial plate count)	27
3.10.2 Fungal analysis in jelly	29
3.11 Antimicrobial discs	30
3.12 Preparation and components of Agar	31
3.13 Antimicrobial Activity test of plant extracts	32
Chapter 4: Results	33
4.1 Physicochemical properties of guava jelly	33
4.2 Nutritional Composition	33
4.3 Phytochemical composition of guava jelly	34
4.4 Sensory Evaluation.....	35
4.5 Microbial analysis	36
4.6 Antibacterial activity of guava leaves extract against <i>Escherichia coli</i>	37
Chapter 5: Discussion	38
Chapter 6: Conclusion	42
Chapter 7: Recommendations and Future Perspectives	43
References	44

Appendices	54
Brief Biography	57

List of Table		
Table 4.1	Physicochemical properties of guava jelly	33
Table 4.2	Nutritional composition of guava jelly	34
Table 4.3	Phytochemical composition of guava jelly	35
Table 4.4	Hedonic rating test for sensory evaluation of guava jelly	36
Table 4.5	Microbiological evaluation of guava jelly	37
Table 4.6	Antimicrobial activity of guava leaves against E.coli	37

List of figure

Figure 3.1	Stepwise design for experiment	12
Figure 3.2	Extraction procedure of guava leaves	16
Figure 3.3	Flow–sheet of Guava Jelly Preparation (control)	17
Figure 3.4	Flow–sheet of Guava Jelly Preparation (Sample B, C, D)	19
Figure 3.5	Determination of Antioxidant Capacity	25
Figure 3.6	Total Phenolic contents (TPC) determination procedure flow diagram	26
Figure 3.7	Total Flavonoid contents (TFC) determination procedure flow diagram	27
Figure 3.8	Simple serial dilution series using with 9 ml blanks along with Standard Plate Count (SPC)	28

List of Abbreviations

%	: Percentage
&	: And
ANOVA	: Analysis of variance
AOAC	: Association of Official Analytical Chemists
TSS	: Total Soluble Solids
CHO	: Carbohydrate
dl	: Deciliter
DPPH	: 2,2-diphenyl-1-picrylhydrazyl
et al	: Et alii/ et aliae/ et alia
etc	: Et cetera
G	: Gram
GAE	: Gallic acid equivalent
Kg	: Kilogramme
mg	: Miligram
TE	: Trolox equivalent
Cfu	: Colony forming unit
QE	: Quercetin equivalents
GAE	: Gallic acid equivalents
L.	: Linn
PPM	: Parts per Million
m	: Meter
DNA	: Deoxyribonucleic acid
spp.	: Species
µg	: Microgram
SPSS	: Statistical Package for Social Science
°C	: Degree Celcius
°B	: Degree Brix
APC	: Aerobic Plate Count

Abstract

Guava (*Psidium guajava*) is a fruit that is widely grown around the world and is well-known for its therapeutic benefits in the treatment of a variety of diseases and ailments. The goal of the study was to make guava jelly with 5%, 10%, and 15% guava leaf extract (sample B, sample C, and sample D respectively) and compare it to control jelly (sample A) in terms of bioactive compounds total antioxidant content, total flavonoid content (TFC), total phenolic content (TPC), antimicrobial activity, sensory and nutritional factors. Guava leaves extract was obtained using an extraction procedure from guava leaves. The extracts are then added to processed guava jelly in proportions of 5%, 10%, and 15%. Among these formulations, the sensory score of guava jelly processed with 15% guava leaves extract (sample D) was shown to be the best. Carbohydrate, fat, protein, ash, and fiber content were measured between at the range of 60.03% to 65.23%, 1.09% to 1.29%, 0.53% to 0.70%, 0.28% to 0.36% and 1.47% to 1.78% respectively. Guava jelly has a vitamin C concentration of 26.63-28.40 mg/100g, according to estimates. In addition, Sample D had the highest concentration of total antioxidant content (3.97 ± 0.011 mg TA/100 mL), total flavonoid content (46.25 ± 0.005 mg QE/100 g) & total phenolic content (10.46 ± 0.152 mg GAE/100mL). The lowest concentration of total antioxidant content (1.96 ± 0.002 mg TA/100 mL), total flavonoid content (32.87 ± 0.001 mg QE/100 g) and total phenolic content (6.40 ± 0.100 mg GAE/100mL) was found in sample A. At first, there was no discernible bacterial load in the jelly, but after 60 days of storage, the bacterial load rapidly grew. At 30-day intervals, yeast and mold development were studied. Incubation in Sabouraud Dextrose agar for 7 days yielded no detectable fungus growth in guava jelly. Yeast and mold infestation were identified in the jelly after 90 days of storage. Furthermore, ethanolic guava leaf extract showed antimicrobial efficacy against *E.coli* which can be used as a substitute of commercial antibiotics.

Keywords: Guava jelly, Guava leaves extract, Bioactive compounds, Nutritional activity, Antimicrobial efficacy, *E.coli*, sensitivity

