

# DEVELOPMENT OF BEETROOT-FLAVORED SWEET POTATO PASTE USING NATURAL SPICES



By  
K. P. Galahitiya



FTC294

Main Library, Eastern University, Sri Lanka

**Department of Biosystems Technology**

**Faculty of Technology**

**Eastern University, Sri Lanka**

**Chenkalady**

**2026**

## ABSTRACT

This research aims to develop a paste by using beetroot and sweet potato with natural spices (Cinnamon, Cardamon and Clove). The sweet potato is rich in fiber, protein and carbohydrate. Beetroot is rich in fiber, dietary fiber, and carbohydrates. This combination improves the nutritional value of the paste instead of that it can minimizing the wastage food and also it will increase the sustainability. This study was produced five treatments of paste samples (T<sub>1</sub>-T<sub>5</sub>). T<sub>1</sub> was the control sample (100% sweet potato and others) while T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, and T<sub>5</sub> by using sweet potato and beetroot 90:10, 80:20, 60:40 and 50:50 formulations, combined with sugar(30g), lemon (8g), and spices(1g) and salt (1g). The developed paste was evaluated by using 9-point hedonic scale for physical (viscosity, spread ability, TSS, and acidity) and proximate (moisture, ash, fat, fiber, protein and carbohydrate) parameters. The results showed that T<sub>5</sub> paste treatment had the optimum blend of sweet potato and beetroot (50:50) had good sensory qualities which increase the sensory quality to improve the nutrition of the paste. Apart from that to ensure the safety and shelf life of the paste under the refrigerated temperature, microbial testing (TPC, Yeast and Mold) also done. Due to the antimicrobial properties of natural spices and refrigerated storage condition the microbial growth was slow down. Viscosity (Pa) ranged from to T<sub>5</sub> 0.26±0.05 to T<sub>1</sub> 2.40±0.17. According to proximate analysis moisture (%) T<sub>5</sub> 0.44±0.01 to T<sub>1</sub> 0.47±0.03, Ash (%) increased T<sub>5</sub> 0.56±0.06 to T<sub>1</sub> 0.75±0.05, Protein (%) increased T<sub>1</sub> 0.01±0.00 to T<sub>5</sub> 0.02±0.00, Fat (%) increased T<sub>5</sub> 11.69±0.16 to T<sub>1</sub> 12.36±0.28 due to the natural spices, Fiber (%) and carbohydrate (%) ranged T<sub>1</sub> 0.05±0.00, T<sub>5</sub> 0.02±0.00 and T<sub>1</sub> 0.34±0.03, T<sub>5</sub> 0.42±0.01 respectively. T<sub>5</sub> showed protein and carbohydrate higher than T<sub>1</sub>.

**Key words:** Combination; Microbial growth; Nutritional value; Sensory quality and Sustainability

# TABLE OF CONTENT

DECLARATION.....	iii
DEDICATION .....	iv
ACKNOWLEDGEMENT .....	v
ABSTRACT.....	vi
LIST OF FIGURES .....	x
LIST OF TABLES .....	xi
ABBREVIATIONS AND SYMBOLS .....	xii
CHAPTER 1 .....	1
INTRODUCTION .....	1
1.1 Background.....	1
1.2 Problem Statement.....	3
1.3 Justification.....	3
1.4 Objectives .....	4
1.5 Limitations.....	4
CHAPTER 2 .....	5
LITERATURE REVIEW.....	5
2.1 Taxonomy.....	5
2.1.1 Taxonomy of Beetroot.....	5
2.1.2 Taxonomy of Sweet Potato .....	5
2.2 General Description .....	5
2.3 Nutritional and Health Benefits .....	7
2.4 Nutritional Value .....	8
2.5 Post-harvest Handling and Storage.....	9
2.6 Role of Natural Spices in Human Health.....	9
2.6.1 Cinnamon ( <i>Cinnamomum verum</i> ).....	10
2.6.2 Clove ( <i>Syzygium aromaticum</i> ).....	10
2.6.3 Cardamom ( <i>Elettaria cardamomum</i> ).....	10
2.7 Sensory Evaluation .....	10
2.7.1 Properties Assessed by Sensory Test .....	11
2.7.2 Benefits of Using Sensory Evaluation .....	12
2.8 Benefits of Natural Colors and Additives .....	13

2.9 Marketing and Consumer Acceptance of Functional Foods .....	13
2.10 Consumer Demand for Plant-Based Products.....	14
2.11 Value Added Products Using Beetroot.....	15
2.12 Value Added Products Using Sweet Potato.....	15
CHAPTER 3 .....	16
MATERIALS AND METHODOLOGY.....	16
3.1 Materials and Equipment .....	16
3.1.1 Material Collection .....	16
3.2 Methodology.....	16
3.2.1 Development of Paste .....	16
3.2.2 Different Compositions of Beetroot and Sweet Potato Paste (Experimental Design).....	17
3.3 Sensory Evaluation .....	19
3.3.1 Materials Used for Sensory Evaluation .....	20
3.3.2 Cording the Samples .....	20
3.3.3 Serving the Samples for Sensory Evaluation.....	20
3.4 Physiochemical Properties of Beetroot-Flavored Sweet Potato Paste.....	21
3.4.1 pH.....	21
3.4.2 Total Soluble Solids (TSS).....	21
3.4.3 Acidity .....	21
3.4.4 Color .....	22
3.4.5 Texture.....	22
3.4.6 Spread Ability .....	22
3.5 Nutrient Analysis of Beetroot-Flavored Sweet Potato Paste .....	22
3.5.1 Moisture Content .....	23
3.5.2 Ash Content.....	23
3.5.3 Determination of Crude Fat .....	24
3.5.4 Determination of Fiber.....	25
3.5.5 Determination of Protein Content.....	26
3.5.6 Determination of Carbohydrate Content.....	28
3.6 Microbial Analysis of Beetroot-flavored Sweet Potato Paste.....	29
3.6.1 Total Plate Count (TPC).....	29
3.6.2 Yeast and Mold Count.....	30

3.7 Statistical Analysis .....	32
CHAPTER 4 .....	33
RESULTS AND DISCUSSION.....	33
4.1 Sensory Evaluation .....	33
4.1.1 Taste .....	33
4.1.2 Color .....	34
4.1.3 Texture.....	35
4.1.4 Aroma.....	36
4.1.5 Overall Acceptability .....	36
4.2 Proximate Analysis .....	38
4.2.2 Ash .....	39
4.2.3 Protein .....	40
4.2.4 Fat .....	41
4.2.5 Fiber .....	42
4.2.6 Soluble Carbohydrate.....	42
4.3 Physiochemical Analysis .....	43
4.3.1 Viscosity.....	43
4.3.2 Color .....	44
4.3.3 Total Soluble Solids (TSS).....	45
4.3.4 pH Value.....	46
4.3.5 Acidity.....	46
4.4 Microbial Analysis (TPC, Yeast and Mold) .....	47
CHAPTER 5 .....	49
CONCLUSION.....	49
RECOMONDATIONS .....	50
REFERENCES .....	51
APPENDICES .....	57