

CONTENTS

CHAPTER NO	TITLE	PAGE NO
	LIST OF TABLES	
	LIST OF FIGURES	
	LIST OF PLATES	
	ABBREVIATIONS	
1	INTRODUCTION	1
2	REVIEW OF LITERATURE	7
	2.1. Unripe Banana Flour – Overview and Food Products	7
	2.1.1. Musa Cultivars	7
	2.1.2. Unripe Banana Flour: Composition and Characteristics	13
	2.1.3. Banana Flour-based Food Products	17
	2.2. Health Benefits of Unripe Banana Flour	21
	2.2.1. UBF Resistant Starch and Health Benefits	21
	2.2.2. Prebiotics and Health: Prebiotic Potential of Unripe Banana Flour	25
	2.2.3. Glycemic Index and Glycemic Response of UBF-based foods	33
	2.3. Ready-to-Eat and Ready-to-Cook Foods	36
	2.4. Research Gap	40
3	METHODOLOGY	41
	3.1. Exploring Consumers’ Knowledge, Attitude, and Practice of Ready-to-Eat and Ready-to-Cook Products	44
	3.1.1. Selection of Survey participants	44
	3.1.2. Conduct of Survey	45

CHAPTER NO	TITLE	PAGE NO
	3.2. Phase 2: Identification and Authentication of Banana Cultivars and Preparation of Unripe Banana Flours of <i>Musa paradisiaca</i>, Peyan (PUBF) and Monthan (MUBF)	47
	3.2.1. Selection of Banana Cultivars	47
	3.2.2. Procurement and Authentication of Unripe Bananas - <i>Musa paradisiaca</i> , Peyan and Monthan	49
	3.2.3. Assessment of Physical Characteristics and Ripening Stage	49
	3.2.4. Processing and Yield of Unripe Banana Flours(UBF) - PUBF and MUBF	50
	3.3. Phase 3: Determination of Starch Morphology, Characteristics, and Functional Properties of Unripe Banana Flours- PUBF and MUBF	54
	3.3.1. Analysis of Starch Morphology and Characteristics- SEM Imaging, XRD, and FTIR Spectra Analysis	54
	3.3.2. Determination of Total Starch, Resistant Starch, Amylose, Amylopectin	55
	3.3.3. Evaluation of Thermal Properties --Differential Scanning Calorimeter Analysis	55
	3.3.4. Determination of Physicochemical Properties	56
	3.3.4.1. Density and Flowability Parameters	56
	3.3.4.2. Foaming Capacity	56
	3.3.4.3. Emulsion Activity and Stability	57
	3.3.4.4. Oil Absorption Capacity	57
	3.3.5. Determination of Flour Hydration and Gelling Properties	57
	3.3.5.1. Flour Hydration Properties	58
	3.3.5.2. Flour Gelling Properties	59
	3.3.5.2.1. Least Gelation Concentration	59
	3.3.5.2.2. Light Transmittance	59
	3.3.5.2.3. Syneresis	59

CHAPTER NO	TITLE	PAGE NO
	3.4. Phase 4: Estimation of Nutrient Composition, Phytonutrients, Antimicrobial Activity, Antioxidant Potential, Prebiotic Potential, and Predicted GI of Unripe Banana Flours- PUBF and MUBF	61
	3.4.1. Estimation of Macronutrients and Micronutrients	61
	3.4.2. Estimation of Phytonutrients	62
	3.4.2.1 Preparation of the UBF Extract	62
	3.4.2.2. Qualitative Screening	62
	3.4.2.3 Quantitative Analysis of Phytonutrients	63
	3.4.3. Assessment of Antimicrobial Activity and Antioxidant Assays	63
	3.4.3.1. Antimicrobial Activity	63
	3.4.3.2. Antioxidant Assays	64
	3.4.4. Determination of Prebiotic Potential	64
	3.4.4.1. Determination of pH, Optical Density, and Colony Count	65
	3.4.4.2. Calculation of Prebiotic Index	65
	3.4.4.3. Inhibition of <i>E. Coli</i> by Fermentation Supernatant	66
	3.4.5. Determination of Predicted GI (eGI)	66
	3.5. Phase 5: Development and Evaluation of Ready-to-Eat and Ready-to-Cook Products Incorporated with Unripe Banana Flours- PUBF and MUBF	68
	3.5.1. Product Concept	68
	3.5.2. Trials and Standardization of the Developed RTE and RTC Products	70
	3.5.3. Sensory Evaluation and Acceptability of RTE and RTC Products	71
	3.5.4. Determination of Physicochemical Properties and Nutrient Composition of RTE and RTC Products Incorporated with 30% UBFs	72

CHAPTER NO	TITLE	PAGE NO
	3.5.5. Shelf-life Analysis of the Developed RTE and RTC Products	75
	3.6.Phase 6: Assessment of Prebiotic Potential, Predicted GI, and Purchase Intent of Developed Ready-to-Eat and Ready-to-Cook Products	77
	3.6.1. Determination of Prebiotic Index of PUBF Cookies and Noodles	77
	3.6.2 Determination of Predicted GI of PUBF Cookies and Noodles	77
	3.6.3 Purchase Intent of PUBF Cookies and Noodles	77
	3.7. Statistical Analysis	79
4	RESULTS AND DISCUSSION	80
	4.1. Phase 1: Consumers' Knowledge, Attitude, and Practice of Ready-to-Eat and Ready-to-Cook Products	83
	4.1.1. Background Information of the respondents	83
	4.1.1.1. Age and Gender	83
	4.1.1.2. Educational status	84
	4.1.1.3. Income and Family Type	84
	4.1.2. Awareness and Knowledge of Functional Foods	85
	4.1.2.1. Knowledge of Functional Foods	85
	4.1.2.2 Key Information Channels for Functional Foods	87
	4.1.2.3. Ability to Recognize Functional Foods and Ingredients	87
	4.1.2.4.Perceived Wellness Advantages of Functional Foods	88
	4.1.3. Respondents' Attitude towards Functional Foods Ingredients in RTE and RTC Foods	89

CHAPTER NO	TITLE	PAGE NO
	4.1.3.1. Importance of Functional Foods in Diet	90
	4.1.3.2 Attitudes on the Safety of Functional Ingredients and Foods	90
	4.1.3.3. Inclination for the Inclusion of Functional Ingredients in RTE/ RTC Foods	91
	4.1.3.4. Attitudes Toward Paying a Premium Price	92
	4.1.3.5. Attitude toward Taste Compromise	92
	4.1.4. Consumption Practice of Commercially Available Functional Foods and Nutraceuticals	93
	4.1.5. Correlation of Knowledge, Attitude, and Practice	94
	4.1.6. Consumers' Choice of Functional Ingredient	96
	4.2. Phase 2: Physical Characteristics, Ripening Stage, and Unripe Banana Flours Yield	98
	4.2.1. Description of the Selected Cultivars	98
	4.2.1.1. <i>Musa paradisiaca</i> , Peyan (ABB)	98
	4.2.1.2. <i>Musa paradisiaca</i> , Monthan (ABB)	99
	4.2.2. Physical Characteristics of the Fruit and Ripening Stage	102
	4.2.3. Flour Yield	103
	4.3. Phase 3: Starch Morphology, Characteristics, and Functional Properties of Unripe Banana Flours- PUBF and MUBF	106
	4.3.1. Starch Morphology and Characteristics-- SEM Images, XRD pattern, and FTIR Spectra	106
	4.3.2. Starch Fractions-Total Starch, Resistant Starch, Amylose and Amylopectin	111
	4.3.3. Thermal Properties	113
	4.3.4. Physicochemical properties	115
	4.3.4.1 Density and Flowability Parameters	115

CHAPTER NO	TITLE	PAGE NO
	4.3.4.2. Foamability and Emulsification Properties	116
	4.3.4.3. Oil Absorption Capacity	117
	4.3.5. Flour hydration and gelling properties	117
	4.3.5.1. Flour Hydration Properties	117
	4.3.5.1.1. Water Holding Capacity	118
	4.3.5.1.2. Water Absorption Capacity and Water Absorption Index	118
	4.3.5.1.3. Water Solubility Index	119
	4.3.5.1.4. Swelling Power and Swelling Volume	119
	4.3.5.2. Flour Gelling Properties	119
	4.3.5.2.1. Least Gelation Concentration (LGC)	119
	4.3.5.2.2. Paste Clarity and Syneresis	120
	4.4. Phase 4: Nutrient Composition, Phytonutrients, Antimicrobial Activity, Antioxidant Potential, Prebiotic Potential, and Predicted GI of Unripe Banana Flours-PUBF and MUBF	122
	4.4.1. Nutrient Composition of Unripe Banana Flours	122
	4.4.1.1. Physicochemical Parameters	122
	4.4.1.2. Macronutrients in Unripe Banana Flours	123
	4.4.1.3. Micronutrients in Unripe Banana Flours	125
	4.4.2. Phytonutrient composition	126
	4.4.2.1 Qualitative Analysis	126
	4.4.2.2. Quantitative Analysis for Phytonutrients	127
	4.4.3. Antimicrobial activity	128
	4.4.4. Antioxidant potential	130
	4.4.4.1. DPPH Free Radical Scavenging Assay	130
	4.4.4.2. Ferric Reducing Antioxidant Power Assay	131
	4.4.4.3. ABTS Free Radical Scavenging Assay	132

CHAPTER NO	TITLE	PAGE NO
	4.4.5 Prebiotic Potential of PUBF and MUBF	133
	4.4.5.1. Change in pH	133
	4.4.5.2. Change in Optical Density	135
	4.4.5.3. Colony Count	137
	4.4.5.4 Prebiotic Index	138
	4.4.5.5. Inhibition of E coli growth	140
	4.4.6. Predicted GI of PUBF and MUBF	141
	4.5. Phase 5: Development and Evaluation of Ready-to-Eat and Ready-to-Cook Products Incorporated with Unripe Banana Flours- PUBF and MUBF	143
	4.5.1. Development and Evaluation of UBF Incorporated Jeera Cookies	143
	4.5.1.1. Standardized Recipe	143
	4.5.1.2 Sensory Scores and Acceptability of UBF Incorporated Jeera Cookies	146
	4.5.1.3 Physical Characteristics of Jeera Cookies	147
	4.5.1.4. Nutrient composition of Jeera Cookies	148
	4.5.1.5. Shelf Life of Cookies	150
	4.5.2 Development and Evaluation of UBF Incorporated Muffins	151
	4.5.2.1. Standardized recipe	151
	4.5.2.2. Sensory Scores and Acceptability of UBF Incorporated Muffins	154
	4.5.2.3. Physical Attributes of Muffins	155
	4.5.2.4. Nutrient Composition of Muffins	156
	4.5.2.5. Shelf Life of Muffins	157
	4.5.3. Development and Evaluation of UBF Incorporated Baked Choco Cereal	159
	4.5.3.1. Standardized recipe	159

CHAPTER NO	TITLE	PAGE NO
	4.5.3.2. Sensory Scores and Acceptability of UBF Incorporated Baked Choco Cereal	161
	4.5.3.3. Nutrient Composition of Baked Choco Cereal	162
	4.5.3.4. Shelf Life of Baked Choco Cereal	163
	4.5.4. Development and Evaluation of UBF Incorporated Noodles	165
	4.5.4.1. Standardized recipe	165
	4.5.4.2. Sensory Scores and Acceptability of UBF Incorporated Noodles	167
	4.5.4.3. Cooking properties of Noodles	169
	4.5.4.4. Nutrient composition of Noodles	169
	4.5.4.5. Shelf-life of Noodles	171
	4.5.5. Development and Evaluation of UBF Incorporated Pasta	172
	4.5.5.1. Standardized recipe	172
	4.5.5.2 Sensory Scores and Acceptability of UBF Incorporated Pasta	174
	4.5.5.3. Cooking Properties of Pasta	175
	4.5.5.4. Nutrient composition of Pasta	176
	4.5.5.5. Shelf-life of Pasta	177
	4.5.6. Pearson Correlation Coefficient between Dietary Carbohydrate Components of the RTE and RTC Products	179
	4.5.7. Summary of Overall acceptability and Percent Daily value of the RTE and RTC products	179
	4.6. Phase 6: Assessment of Prebiotic Potential, Predicted GI, and Purchase Intent of Developed Ready-to-Eat and Ready-to-Cook Products	182
	4.6.1. Prebiotic Potential of PUBF Cookies and Noodles	182
	4.6.2. Predicted GI of PUBF Cookies and Noodles	188
	4.6.3. Purchase Intent of PUBF Cookies and Noodles	191

CHAPTER NO	TITLE	PAGE NO
5	SUMMARY AND CONCLUSION	192
	BIBLIOGRAPHY	207
	APPENDICES	
	GLOSSARY	
	PUBLICATIONS	
	PLAGIARISM REPORT	