DEVELOPMENT OF

NUTRITIONALLY-BALANCED SNACK PRODUCT

FOR URBAN SCHOOL-AGE THAIS

A thesis
presented in partial fulfilment of
the requirement for the degree of
Doctor of Philosophy in Product Development
at Massey University

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1986
ABSTRACT

A product development system for developing a nutritionally-balanced snack product for urban school-age Thais was designed. Systematic quantitative methods and techniques were planned and used in the major steps of the product development process. Five prototype models for the major product development activity steps evolved during the research. These included a model for formulation development, a model for process development, a model for sensory analysis development, a model for product evaluation, and the overall model for systematic nutritional product development (NPD model).

A fruit and nut snack bar was designed and then a commercial process developed to produce a product that was acceptable to the child consumers in Bangkok schools. Thai snack foods were classified scientifically and then three types -- Thai cookie, Thai pastry, and "rice-crisp" -- were identified as the most suitable for nutritional snacks for school children. The selection of appropriate ingredients, method of cooking and snack-type was based on a consumer survey with school children from 7-18 years old in Bangkok. Product ideas were generated by brainstorming and a literature review, and then were systematically screened and evaluated using the collected statistical data and also predicted information on the aspects of finance, technology, market and consumer. The "ideal product profile" was determined from the children's attitudes and behaviour towards snack foods.

The effective and reliable method developed for the formulation system comprised the major steps of "best-estimate" experimentation, experimental trials, linear programming experiments, acceptability tests and final adjustment of the formula. Selection of suitable formulae was based on acceptability tests with a laboratory taste panel using a profiling technique.

For process development, a Plackett and Burman experimental design was used for screening the process variables and factorial experimentation for optimising the process. Stepwise Regression and Yates' analysis methods were compared in the analysis of the results. The latter was considered more suitable for this project because it was easy to use, needed less time and money, and was effective.
A ratio profile test developed at Massey University was used in the development of product profiles through the whole system to develop the product. This technique was found effective in distinguishing the difference of the samples from the "ideal" product. A profile test using linear scaling was found suitable for a panel with some level of training, while that using category scaling for a panel with lower capabilities for sensory judgment. Four types of taste panels used during the sensory analysis development process were laboratory panel, special panel, consumer panel and consumer survey. The sample numbers of the panels were 6, 5, 30 and 1094 respectively. In general, the laboratory panel could predict the reactions of the consumer panel and the consumer survey in evaluating the product subjectively, and the special panel could differentiate the characteristics of the intermediate products desired by the next process.

An evaluation system used in this study comprised nutritional quality test, microbiological test, and storage test. Accelerated Shelf-Life Test using a factorial design was found an effective method for a storage test, while the Arrhenius Relationship Model was used for product shelf-life prediction. The most suitable factorial matrix was found to be "70, 90% RH; 25, 35, 45 °C". These conditions of storage could be used for optimisation of storage condition, by Yates' analysis of the product quality at each storage time, and for estimation of shelf-life, by linear plotting technique of the product quality during the whole time of storage.

This project is worth continuing for commercialization by the private sector, and the designed prototype models are recommended for use in the systematic PD process to develop nutritional snack products.
ACKNOWLEDGEMENTS

The research in this thesis was supported by financial assistance from a scholarship provided by the Ministry of Foreign Affairs, New Zealand. I express my appreciation for this assistance.

I will always be grateful to my major supervisor, Dr. Mary D. Earle, for the guidance, encouragement and patience, and in particular for her understanding my Thai way of English expression.

To my co-supervisors, Dr. Jim Harper, N.Z. Dairy Research Institute, Palmerston North and Dr. Prasert Saisithi, Institute of Food Research and Product Development, Kasetsart University, I express my appreciation for their useful suggestions.

The successful completion of the research was due to the cooperation in one way or another of many people in New Zealand and in Thailand. In particular I would like to thank -

- Prof. R. L. Earle and the staff of the Faculty of Technology, Massey University.
- Prof. E. L. Richards and the staff of the Department of Food Technology, Massey University.
- The staff of the Food Technology Research Centre, Massey University.
- The staff of the Computer Research Centre, Massey University.
- The staff of the Library, Massey University.
- Mr. Rex Ussher and the staff of the Sanitarium Health Food Company, Palmerston North, New Zealand.
- Thai students at Massey University who were taste panelists.
- Assist. Prof. Tasanee Sorasuchat and the staff of the Faculty of Agro-Industry, Kasetsart University.
- Assoc. Prof. Vichai Haruetaitanasasan and the staff of the Department of Product Development, Kasetsart University.
- The staff of the Library, Kasetsart University.
- Mr. Vidhaya Noljaiboon and the staff of the RIN factory, Chachuengsao, Thailand.
- Miss Chuleeporn Peumsomboon, the Department of Marketing, Kasetsart University and the students of the department who helped with the interviewing.
- Mr Thanes Bodeesorn and the staff of the National Statistical Office, Bangkok.
- Dr. Lolita Meksongsee, the Department of Biochemistry, Kasetsart University.
The staff of the Division of Planning and Statistics, Land Development Department, Bangkok.

The staff of the Computer Centre, Kasetsart University.

The staff of the Division of Nutrition, the Department of Public Health, Bangkok.

The staff of the Institute of Food Research and Product Development, Kasetsart University.

The staff and the students of the Faculty of Agro-Industry, Kasetsart University who were taste panelists.

Dr. Hester R. Cooper, N.Z. Dairy Research Institute, Palmerston North.

Mrs. Marian Hilder, Linguistic Section, the Department of Modern Languages, Massey University.

Mr. Kees Kornoorffer, Illustrator, Massey University.

Mrs. Veronica Fieldsend who typed parts of this thesis.

The staff and pupils of all the schools mentioned in the consumer tests and consumer surveys in this thesis.

Finally, I would like to thank my husband Dusit and my children Supachai, Hatai and Naiyana, for their support mentally and physically during the past three years.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>ABSTRACT</th>
<th>ii</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>iv</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xix</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xxiv</td>
</tr>
<tr>
<td>LIST OF APPENDICES</td>
<td>xxvi</td>
</tr>
</tbody>
</table>

## CHAPTER

1. INTRODUCTION AND GENERAL LITERATURE REVIEW
   1.1 Malnutrition and Eating Patterns in Thailand 2
   1.2 Development of Nutritional Products 4
   1.3 Marketing of Nutritional Snack Products 6
   1.4 Literature Review on Thai Snack Foods 8
      1.4.1 Introduction 8
      1.4.2 Eating of Snacks in Thailand 8
         1.4.2.1 Historical Background of Thai Snacks 9
         1.4.2.2 Thai Snacks in Four Regions 9
         1.4.2.3 The Confused Classification of Thai Meals, Snacks, Desserts and Sweets 9
      1.4.3 Classification of Thai Snack Foods 11
         1.4.3.1 Dry-Heat Processed Snacks 11
         1.4.3.2 Moist-Heat Processed Snacks 11
         1.4.3.3 Heating-in-Fat Processed Snacks 11
         1.4.3.4 Dried Snacks 12
      1.4.4 Thai Snack Food Quality and Acceptance 12
      1.4.5 Basic Ingredients, Formulae and Processes for Thai Snack Foods 13
   1.5 The Possible Snack Products for This Project 13
   1.6 The Need for a Quantitative Systematic Model for Snack Product Development for Urban School-Age Thais 14
   1.7 Aims of the Present Project 15
2. PROJECT METHODS
   2.1 Introduction 16
   2.2 Consumer Study Methods 16
   2.3 Formulation and Process Development Methods 17
   2.4 Test Methods 17
      2.4.1 Introduction 17
      2.4.2 Nutritional Quality Test 18
      2.4.3 Objective Tests 20
      2.4.4 Microbiological Tests 23
      2.4.5 Subjective Tests 24

3. ATTITUDES AND BEHAVIOUR OF URBAN SCHOOL-AGE THAIS TOWARDS
   SNACK FOODS 27
   3.1 Introduction 27
   3.2 Methods and Techniques in Consumer Survey Research 27
      3.2.1 Definition and Classification 27
      3.2.2 Methods and Techniques Used in Consumer Surveys on Snacks 28
   3.3 Methods and Techniques Used for the Present Surveys 29
      3.3.1 Introduction 29
      3.3.2 The First Survey 29
         3.3.2.1 Aims and Objectives 29
         3.3.2.2 Sample 29
         3.3.2.3 Questionnaire 30
         3.3.2.4 Survey Method 30
         3.3.2.5 Date 31
         3.3.2.6 Data Processing 31
         3.3.2.7 Data Analysis and Interpretation 31
      3.3.3 The Second Survey 31
         3.3.3.1 Aims and Objectives 32
         3.3.3.2 Sample 32
         3.3.3.3 Questionnaire 33
         3.3.3.4 Information Expected to Be Obtained 34
         3.3.3.5 Survey Method 34
         3.3.3.6 Date 35
         3.3.3.7 The Product 35
         3.3.3.8 Data Processing 35
         3.3.3.9 Data Analysis and Interpretation 35
   3.4 Snack Buying Behaviour and Attitudes in General 35
      3.4.1 Snack-Type Preference 35
3.4.2 Frequency of Snacking after School  
3.4.3 Buying of Snacks  
3.4.4 Criteria for Snack Buying Choice  
3.4.5 Use of Snack Food Outlets  
3.4.6 Pocket Money and Money Spent on Snack Foods  
3.4.7 Motivation for Snack Buying  
3.5 General Behaviour Related to Snacking  
3.5.1 Times for Snacks and Dinner  
3.5.2 Drink Type after Snacking  
3.6 Preference for the Three Suggested Snack Products  
3.6.1 The Most Preferred Snack and the Buying Willingness  
3.6.2 Preferred Attributes of the Three Suggested Snacks  
3.6.3 Expected Frequency of Buying the Product to be Developed  
3.6.4 Expected Package and Price of the Product to be Developed  
3.7 Acceptability of the Developed Snack Product  
3.7.1 Opinions on Product Colour  
3.7.2 Opinions on Product Size  
3.7.3 Opinions on Product Texture  
3.7.4 Opinions on Product Flavour  
3.7.5 The Acceptability of the Product  
3.7.6 Expected Amount of Product for Snacking at One Time  
3.7.7 Expected Price per Packet  
3.7.8 Buying Willingness  
3.7.9 Buying Frequency  
3.8 General Behaviour and Attitudes Related to the Developed Snack Product  
3.8.1 Major Reason for Buying and Branding Suitability  
3.8.2 Drink Type after Snacking  
3.9 Summary and Recommendations Based on Survey Results  
3.9.1 Summary and Recommendations from the First Survey  
3.9.2 Summary and Recommendations from the Second Survey  
3.10 Comparison of the Findings of the Two Surveys  
3.10.1 Comparison of Snacking Habits
3.10.2 Comparison of Acceptability for the Product 61
3.10.3 Comparison of Buying the Product 61
3.10.4 Comparison of Reaction of Schools Previously Surveyed and Not Surveyed 63
3.10.5 Comparison of Survey Methods 64
3.11 Conclusion and Recommendation 65

4. PRODUCT SCREENING AND EVALUATION 67
4.1 Introduction 67
4.2 Methods and Techniques for Screening and Evaluation 68
   4.2.1 Screening 68
   4.2.2 Analysis Evaluation 71
   4.2.3 Final Evaluation 72
   4.2.4 Selection of Screening and Evaluation Methods for Nutritional Snack Products 73
4.3 A Step before Screening of Product Ideas for the Present Development Project 74
   4.3.1 Introduction 74
   4.3.2 Methods and Techniques for Idea Generation 75
   4.3.3 Literature Review 75
   4.3.4 Brainstorming 75
   4.3.5 Product Ideas Summary 76
4.4 Sequential Screening of Thai Snacks for the Nutritional Product Development Project 76
   4.4.1 Selection of Sequential Screening Techniques 76
   4.4.2 Criteria for Sequential Screening 78
   4.4.3 Experiment on Comparison of Selected Techniques and Judges Under Sequential Screening Method 78
   4.4.4 Results and Discussion of the Comparison of Selected Sequential Screening Techniques and Judges 80
   4.4.5 Product Ideas Selected 82
4.5 Checklist Screening of Thai Snacks for Nutritional Product Development Project 83
   4.5.1 Introduction 83
   4.5.2 Criteria for Checklist Screening 83
   4.5.3 Procedures for Checklist Screening 84
   4.5.4 Results and Discussion on Checklist Screening 84
   4.5.5 Product Ideas Selected 86
4.6 Facts and Figures for Analysis Evaluation 86
   4.6.1 Introduction 86
4.6.2 Generation of Preliminary Product Concepts for Analysis Evaluation of Thai Snacks
4.6.3 Availability and Costs of Raw Materials
4.6.4 Quality/Price Relationship
4.6.5 Profitability
4.6.6 Expected Competition
4.6.7 Effect of Processing on Nutrients
4.6.8 Ease of Enrichment
4.6.9 Equipment Necessary
4.6.10 Production Capacity

4.7 Analysis Evaluation by Probability Technique of Thai Snacks for Nutritional Product Development Project
4.7.1 Introduction
4.7.2 Criteria for Analysis Evaluation
4.7.3 Procedures for Analysis Evaluation
4.7.4 Results and Discussion on Analysis Evaluation
4.7.5 Product Ideas Selected

4.8 Discussion on a Screening System for Nutritional Snack Products

4.9 Final Products Selected

5. FORMULATION AND PROCESS DEVELOPMENT AND STATISTICS
5.1 Introduction
5.2 Methods and Techniques in Formulation and Process Development
5.2.1 Introduction
5.2.2 Methods and Techniques for Formulation and Process Development
5.2.3 Methods and Techniques for Quality Testing
5.2.4 Methods and Techniques for Statistical Analyses
5.2.5 Summary and Conclusion

5.3 An Approach to Formulation Development
5.3.1 Introduction
5.3.2 The First Defined Product Concept Based on the Consumer Survey Result and the Project Objectives
5.3.3 "Best-Estimate" Experimentation
5.3.3.1 Phase 1: The Study on Fruit Preparation
5.3.3.2 Phase 2: The Study on Whole Product Preparation
5.3.4 The Second Defined Product Concept after an Application of the Findings from "Best-Estimate" Experiments
5.3.5 An Empirical Approach to Appropriate Methods of Ingredient Preparation
5.3.6 An Empirical Approach to an Appropriate Combination of the Product Layers (Outside/Inside Ratio)
5.3.7 Discussion and Conclusion
5.4 The Formulation of Nutritionally-Balanced Snack by Linear Programming Techniques
5.4.1 Introduction
5.4.2 Factors Concerned
5.4.3 Data Collection
  5.4.3.1 The Composition and Cost of Raw Materials
  5.4.3.2 The Consumption Quantity
5.4.4 Linear Programming Models
  5.4.4.1 Initial Model
  5.4.4.2 Relaxed Nutrient Constraint Model
  5.4.4.3 The Final Constraint Model
5.4.5 Linear Programming Input and Output
  5.4.5.1 Linear Programming Input
  5.4.5.2 Linear Programming Output
5.4.6 The Solution and the Selection of the Best Formulae for Further Development
5.4.7 The Interactions During LP Experimentation
5.4.8 The Adjustment of the Raw Material Input Data for Recipe Designing Purposes
5.4.9 Acceptability Test of the Selected Formulated Product
5.4.10 Final Adjustment of LP Developed Formula and Determination of Food Additive Levels
  5.4.10.1 Introduction
  5.4.10.2 Selection of Adjustment Means
  5.4.10.3 Reformulation of Nutritionally-Balanced Snack Product
  5.4.10.4 Selection of Formula for the Taste Panel Retest
  5.4.10.5 Preparation of Samples for the Panel Retest
5.4.10.6 Method and Procedure for the Taste Panel Retest

5.4.10.7 Results of the Final Adjustment of the LP Developed Formula

5.4.10.8 LP Developed Formula Selected for Process Development

5.4.11 Discussion and Conclusion

5.5 An Approach to Process Development

5.5.1 Introduction

5.5.2 Literature Review on Raw Materials and Processes

5.5.2.1 Raw Materials

5.5.2.2 Process

5.5.3 Outlining of Process and Raw Materials for the Developmental Experimentation

5.5.4 Screening of Process Alternatives

5.5.5 Selected Key Operations

5.5.6 Actual Unit Operations Used in Pilot Plant Experiments

5.5.6.1 DSC-Banana Process

5.5.6.2 BSE-Mungbean Process

5.5.6.3 MP-Snack Operation

5.5.7 Identification of Input and Output Variables

5.5.8 Methods and Techniques for Process Development

5.5.8.1 Introduction

5.5.8.2 Methods and Techniques Used

5.5.8.3 Experimental Designs

5.5.8.4 The Statistical Analyses

5.5.8.5 The Quality Tests

5.5.9 Process Development Experimentation

5.5.10 Results of Process Development Experimentation

5.6 Effects of Input Variables on DSC-Banana

5.6.1 Introduction

5.6.2 Effects of Initial Temperature of Syrup for Cooking

5.6.3 Effects of Ripeness of Banana Used

5.6.4 Effects of Sugar-Type

5.6.5 Effects of Cooking Time

5.6.6 Summary and Conclusion

5.6.6.1 Summary and Conclusion Based on Experimental Designs
5.6.6.2 Summary and Conclusion Based on Experimental Procedures

5.7 Effects of Input Variables on BSE-Mungbean
5.7.1 Introduction
5.7.2 Effects of Soaking Temperature and Time
5.7.3 Effects of Water/Mungbean Ratio
5.7.4 Effects of Boiling Temperature and Time
5.7.5 Effects of Hot-Stirring Temperature and Time
5.7.6 Effects of Hot-Stirring Speed and Revolution Type
5.7.7 Effects of Gap between Stirrer and Bottom of Pan
5.7.8 Effects of Evaporating Temperature and Time
5.7.9 Effects of Batch-Size
5.7.10 Effects of Pan-Type
5.7.11 Summary and Conclusion

5.8 Effects of Input Variables on MP-Snack
5.8.1 Introduction
5.8.2 Effects of Mixing Time
5.8.3 Effects of Pressing Force
5.8.4 The Relation of Effects Obtained from Hydraulic Presser and Developed Presser & Cutter
5.8.5 Summary and Conclusion

5.9 The Complete Process Developed
5.10 Testing the Process

5.11 Comparison of Statistical Analysis Methods
5.11.1 Introduction
5.11.2 Comparison of Selected Results of Process Development Experimentation by Two Statistical Analysis Methods
5.11.3 Conclusion
5.12 Discussion and Conclusion

6. SENSORY ANALYSIS DEVELOPMENT AND STATISTICS
6.1 Introduction
6.2 Methods and Techniques in Sensory Analysis of Foods Including Statistics
6.2.1 Introduction
6.2.2 Methods and Techniques for Sensory Analysis and Statistics in General
6.2.3 Methods and Techniques for Sensory Analysis and Statistics in PD System

6.3 Methods and Techniques in the Present Product Development Project

6.3.1 Introduction

6.3.2 Definition of Selected Sensory Analysis Terms Used in This Study

6.3.2.1 Panel Terms

6.3.2.2 Sensory Scaling Methods

6.3.2.3 Score Terms

6.3.2.4 Data Analysis Terms

6.3.2.5 Other Associated Terms

6.4 Generation and Uses of Ideal Product Profiles

6.4.1 Introduction

6.4.2 Selection of Sensory Attributes and the Taste Panel Form

6.4.3 The Panelists

6.4.4 The Preparation for the Panel Tests

6.4.5 Panel Orientation/Training

6.4.6 Panel Procedure

6.4.7 Method of Profile Analysis

6.4.8 Data Processing and Analysis

6.4.9 Results and Discussion of the First Ideal Product Profile Generation

6.4.9.1 Profiles of Product Ideal and Product Sample

6.4.9.2 Correlation of Selected Attributes Using Ratio Means

6.4.10 Results and Discussion of the Second Ideal Product Profile Generation

6.4.10.1 Profiles of Product Ideal and Product Sample

6.4.10.2 Correlation of Selected Attributes

6.4.11 Other Ideal Product Profile Generated

6.4.12 Summary of the Profiles of Developed Products

6.5 Sensory Profile Analysis Development

6.5.1 Introduction

6.5.2 Experimentation and Aims

6.5.3 Principles of Sensory Profile Analysis Development

6.5.4 Taste Panel Form
6.5.5 Setting Up the Panel and Panel Orientation/Training
6.5.6 Methods and Procedures
6.5.7 Panel Procedure
6.5.8 Sensory Inspections of Stored Product

6.6 Comparison Studies
6.6.1 Introduction
6.6.2 Comparison of the Panel Types
  6.6.2.1 Aim and Objectives
  6.6.2.2 Comparison Study Plan
  6.6.2.3 Comparison between Laboratory Panel and Consumer Panel
  6.6.2.4 Comparison between First and Second Panels of Similar Type
  6.6.2.5 Comparison of Three Types of Panels
  6.6.2.6 Comparison of Product Profiles of Second Laboratory Panel Based on their Own "Ideals" and on Consumer Panel "Ideals"
  6.6.2.7 Conclusion on Relation of Results from Different Types of Panels
6.6.3 Comparison of the Three Methods of Analysing Linear Scaling Data
  6.6.3.1 Aim and Objectives
  6.6.3.2 Comparison between Numerical Profiles Obtained from Score, Ratio, and Interval Data
  6.6.3.3 Comparison of Correlation Coefficients Obtained from Ratio and Interval Data
  6.6.3.4 Pros and Cons of Score, Ratio, and Interval Methods Based on the Results from the Comparison Experiments
  6.6.3.5 Conclusion on Methods of Analysing Profile Data
6.6.4 Comparison of the Two Methods of Analysing Category Scaling Data
  6.6.4.1 Aim and Objectives
  6.6.4.2 Comparison Experiment
  6.6.4.3 Conclusion on Analysing Category Profile Scaling
6.6.5 Comparison of First and Second Consumer Test Products
6.6.5.1 Objective
6.6.5.2 Comparison Experiments
6.6.5.3 Conclusion on Acceptability of 2nd Consumer Test Product
6.6.6 Comparison of the Ideal Product Profiles of Different Panels
6.6.6.1 Objective
6.6.6.2 Comparison Experiment
6.6.6.3 Conclusion on Ideal Product Profiles
6.7 Setting up Reference C.V. Values for Sensory Analysis of a Developed Product by Profiling Technique
6.7.1 Introduction
6.7.2 Method and Procedures
6.7.3 Results
6.7.4 The Application of Reference C.V. Values for Judgment of Standard Deviation Size
6.7.5 Discussion and Conclusion on Use of "C.V." Values
6.8 Discussion and Recommendations on Sensory Testing Methods in Product Development

7. PRODUCT EVALUATION AND PRODUCT QUALITY PREDICTION
7.1 Introduction
7.2 Methods and Techniques for Evaluation of Developed Nutritional Product
7.3 Methods and Procedures for the Present Developed Nutritional Product
7.3.1 Methods and Procedures for Product at Different Stages of Development
7.3.2 Storage Test
7.3.2.1 Introduction
7.3.2.2 Background
7.3.2.3 Experimental Designs for Storage Test
7.3.2.4 Reference Samples
<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.3.2.5 Materials and Equipment for Storage Test</td>
<td>238</td>
</tr>
<tr>
<td>7.3.2.6 The Date for Storage Test</td>
<td>238</td>
</tr>
<tr>
<td>7.3.2.7 Methods and Techniques for Quality Testing and Analysis</td>
<td>240</td>
</tr>
<tr>
<td>7.4 Evaluation of Product at Different Stages of Development</td>
<td>240</td>
</tr>
<tr>
<td>7.4.1 Intermediate-Material Evaluation</td>
<td>240</td>
</tr>
<tr>
<td>7.4.2 Nutritional Evaluation</td>
<td>242</td>
</tr>
<tr>
<td>7.4.3 Microbiological Test, Objective Test, and Subjective Test of Products</td>
<td>247</td>
</tr>
<tr>
<td>7.4.4 Conclusion on Quality of Final Product</td>
<td>249</td>
</tr>
<tr>
<td>7.5 Product Evaluation During Determination of Storage Life</td>
<td>250</td>
</tr>
<tr>
<td>7.5.1 The Change of Stored Product Ratio Profile with Time</td>
<td>250</td>
</tr>
<tr>
<td>7.5.2 Changes of Profiles of Stored Product in Different Packages and at Different Storage Temperatures</td>
<td>252</td>
</tr>
<tr>
<td>7.5.3 Comparison between Reference and Samples of Other Storage Conditions</td>
<td>254</td>
</tr>
<tr>
<td>7.5.4 Significant Effects of Input Variables on Product Sensory Attributes</td>
<td>255</td>
</tr>
<tr>
<td>7.5.5 Selected Significant Models</td>
<td>257</td>
</tr>
<tr>
<td>7.5.6 Changes in Moisture Content During Storage</td>
<td>257</td>
</tr>
<tr>
<td>7.5.7 Conclusion on Product Quality During Storage</td>
<td>257</td>
</tr>
<tr>
<td>7.6 Estimation of Product Shelf-Life and Product Quality Prediction</td>
<td>258</td>
</tr>
<tr>
<td>7.6.1 Introduction</td>
<td>258</td>
</tr>
<tr>
<td>7.6.2 Determination of the 'k' Value</td>
<td>258</td>
</tr>
<tr>
<td>7.6.3 Linear Plots and Main Findings</td>
<td>259</td>
</tr>
<tr>
<td>7.6.4 Calculation of Shelf-Life</td>
<td>260</td>
</tr>
<tr>
<td>7.6.5 Comparison between Calculated Shelf-Life and Further Sensory Inspection Results</td>
<td>262</td>
</tr>
<tr>
<td>7.6.5.1 Objectives</td>
<td>262</td>
</tr>
<tr>
<td>7.6.5.2 Comparison Experiment</td>
<td>262</td>
</tr>
<tr>
<td>7.6.5.3 Discussion and Conclusion on Shelf-Life</td>
<td>263</td>
</tr>
<tr>
<td>7.6.6 Determination of Product Adjustment Based on Product Quality Prediction</td>
<td>264</td>
</tr>
<tr>
<td>7.7 Discussion and Conclusion</td>
<td>264</td>
</tr>
</tbody>
</table>
8. DISCUSSION AND CONCLUSION

8.1 The Necessity for the Project and the Aim of the Thesis

8.2 The Systematic Models Designed for the Product Development Process
   8.2.1 Model for Formulation Development
   8.2.2 Model for Process Development
   8.2.3 Model for Sensory Analysis Development
   8.2.4 Model for Product Evaluation
   8.2.5 Framework of the Systematic NPD Model
   8.2.6 Discussion on Models

8.3 Specification of the Product

8.4 Specification of the Process

8.5 Further Validation before Production of the Product on an Industrial Scale

8.6 Conclusion

REFERENCES

APPENDICES 1.1 - 8.5
APPENDICES 2.1M - 3.5M
APPENDICES 4.1M - 4.7M
APPENDICES 5.1M - 5.9Mb
APPENDICES 7.1M - 7.6M

Microfiche 1
Microfiche 2
Microfiche 3
Microfiche 4

xviii
LIST OF TABLES

2.1 References for methods and techniques for nutritional measurements of developed nutritional product. 19
2.2 Objective measurements of intermediate/finished products and equipment used. 21
3.1 The demographic characteristics of the population sample in the 1st survey 30
3.2 The demographic characteristics of the population sample in the 2nd survey 33
3.3 Snack buying behaviour and attitudes in general 36
3.4 General behaviour related to snacking 41
3.5 Preference for the three suggested products 43
3.6 Preferred attributes of snacks 44
3.7 Expected frequency of buying the product to be developed 44
3.8 Expected package and price of product to be developed 45
3.9 Preference for the developed snack product 46
3.10 Expected amount eaten, price, and buying of developed product 50
3.11 Major reason for buying and branding suitability 52
3.12 Comparison of snacking habits 59
3.13 Comparison of preference for the product 61
3.14 Comparison of buying the product 62
3.15 Comparison of reaction of schools previously surveyed and not surveyed 63
3.16 Comparison of survey methods 65
4.1 Some of the screening methods from the literature review 70
4.2 Characteristics and judgement for screening methods 70
4.3 Brief form of factor definition for sequential screening 79
4.4 Summary result of experiment on comparisons among techniques and judges under sequential screening method 81
4.5 Criteria factors and weights for checklist screening 84
4.6 Result of checklist screening 85
4.7 Sequential screening of fruit & vegetable products for stuffing 87
4.8 Preliminary product concepts and key words for the most feasible main basic ingredients and their ratios

4.9 A comparison of profit-ranking results from different methods of discountings

4.10 Estimated judgment of the "ease-of-enrichment" factor

4.11 Factors and weights for probability evaluation

4.12 An example of probability assessment on dried fruits in thin layers of pressed flour mixture

4.13 Summary result of critical evaluation by probability technique

5.1 The first defined product concept.

5.2 The second defined product concept after an application of the findings from "best-estimate" experiment.

5.3 Summary result of experimental trials for appropriate methods of ingredient preparation.

5.4 Summary result of experiment on appropriate combination of product layers (outside/inside ratio).

5.5 Important factors considered for linear programming.

5.6 Nutrient requirement for Thai Children aged 10-12 years at different percentages of the total requirement.

5.7 Protein-Energy Interrelationship.

5.8 Comparison of prior and final constraints for linear programming.

5.9 Arrangement of linear programming input.

5.10 Selected solutions from different sets of formulae by LP Experiments.

5.11 Comparison of selected attributes of products from selected LP formulae.

5.12 Selected formulae for further development.

5.13 Product ratio profile from the 1st acceptability test

5.14 Formulae chosen for preparation experimentation.

5.15 Means and levels of significance for sensory attributes of products from Formulae 1, 2, 3 and 4.

5.16 Ratio profile of product selected for process development

5.17 A comparison between properties of selected formula and constraints.
5.18 Summary results of experimental trials on the processes.

5.19 Input-output variables and levels of input variables for process experiment.

5.20 Summary of methods and techniques used in the process development stage.

5.21 Factorial experiment for a 2 factor, 2 level experiment.

5.22 Problem definitions and experiment objectives for process development.

5.23a Summary of results of process development experimentation (PDE summary results) on DSC-banana, EXP1.

5.23b PDE summary results on DSC-banana, EXP2.

5.23c PDE summary results on DSC-banana, EXP3.

5.23d PDE summary results on MSE-mungbean, EXP4 (Plackett and Burman Screening Experiment).

5.23e PDE summary results on MSE-mungbean, EXP5.

5.23f PDE summary results on MP-snack, EXP6.

5.24a Summary of significant effects for DSC-HOM banana from EXP1.

5.24b Summary of significant effects for DSC-HOM banana from EXP2.

5.24c Summary of significant effects for DSC-NAMWA banana from EXP3.

5.25 Stages for hot-stirring of mungbean.

5.26a Summary of significant effects for BSE-mungbean from EXP4 (Plackett and Burman Experiment).

5.26b Summary of significant effects for BSE-mungbean from EXP5.

5.26c Summary of significant effects for MP-snack from EXP6.

5.27 Comparison between consumer-test and factory products.

5.28 Comparison of selected results on process development experimentation by two statistical analysis methods.

6.1a Score means of ideal and sample and ratio mean profile of LP formulated product sample by 1st lab panel.

6.1b Means and levels of difference of selected attributes of 1st sensory product ideal and 1st LP formulated product.
6.1c Correlation values among selected attributes using ratio means of LP formulated product.

6.2a Numerical score means of ideal and sample and ratio mean profile of sample by 2nd consumer panel.

6.2b Correlation values among attributes by using ratio means of the 1st consumer test product by the 2nd consumer panel.

6.3a Sensory analysis development experimentation.

6.3b Panel group setting and method of orientation/training the panel.

6.3c Experiment groups based on similarity of methods used.

6.4 Comparison study plan on panel types.

6.5a Attribute ratio means of 1st consumer test product by lab and consumer panels.

6.5b Attribute score means of 2nd consumer test product by three panel types.

6.5c Attribute ratio means of phase 1 consumer test product by 2nd lab panel based on different ideals.

6.6 Profiles of LP reformulated product by 1st lab panel using three methods for analysing data.

6.7 Correlation coefficients of sensory attributes of the LP formulated product using ratio and interval data (moving ideal data).

6.8 Pros and Cons of score, ratio, and interval methods of analysing profile test data.

6.9 Mean profiles of sensory attributes by consumer panel and consumer survey using two methods for analysing category scaling data.

6.10 Sensory attribute means of 2nd consumer test product by 2nd consumer panel.

6.11 Ideal product profiles of 1st and 2nd lab panels and 2nd consumer panel.

6.12a Ratio means and standard deviations for product profiles by lab panel (N=6) and reference C.V. Values.

6.12b Reference C.V. values (%).
7.1 Storage conditions and their abbreviations.  
7.2 Dates for quality tests of stored samples.  
7.3 Comparison of subjective and objective tests of intermediate-materials using correlation.  
7.4a Nutritional composition of products at different stages (in 100g).  
7.4b Amino acid composition of developed product.  
7.5 Comparison of critical attributes of final products and constraints.  
7.6 Comparison between reference and samples of other storage conditions.  
7.7a Main effects of storage conditions at Day 14 by Yates' and Stepwise Regression Analysis.  
7.7b Selected models for optimisation of temperature for products in PP packets and predicted attributes at 25°C.  
7.8 Calculation of shelf-life at 28°C of storage temperature based on selected product attribute quality.  
8.1 Major points of specification of the developed product.  
8.2 Major points of specification of the developed processes/operations.
LIST OF FIGURES

3.1 Frequency of Snacking after School by Age 37
3.2 Criteria for Snack Buying Choice 39
3.3 Use of Food Outlets for Snack Buying by Urban School-Age Thais 39
3.4 Food Advertisement Normally Heard and Seen 40
3.5 Motivation for Buying New Snack Product 40
3.6a Preference for the Product by Age 49
3.6b Preference for the Product by School 49
3.7a Major Reasons for Buying Developed Product by Age 53
3.7b Major Reasons for Buying Developed Product by School 53
3.8a Drink Type after Snacking by Age 55
3.8b Drink Type after Snacking by School 55
3.9 Graphical Comparison of Drinks after Snacking 60

4.1 Life-cycles of 3 Groups of Preliminary Product Concepts 92

5.1 Master Diagram for Systematic Formulation/Process Development. 108
5.2 Process Alternatives for Hot-Stirred Mungbean. 145
5.3 Mechanical Hot-Stirring Equipment. 148
5.4 Mechanical Pressing and Cutting Equipment. 148

6.1 Product Acceptability Test by 2nd Consumer Panel. 201
6.2 Ratio Mean Profile Using Linear Scales: LP Formulated Product by 1st Lab Panel. 203
6.3 Comparison of Sensory Profiles of 1st and 2nd Stage Developed Products by 2nd Consumer Panel Using Three Methods of Analysis. 223

7.1 Ratio Profile Change of Stored Product with Time. 251
7.2 Sensory Mean Profiles of Product Samples Stored 21 days at 75% RH and at Different Storage Temperatures and in Different Packages Compared with the Profile at Day 0 and of Product Stored at 4 C. 253
7.3a Linear Plots of 'k' Values Using Rancidity Scores for Shelf-Life Estimation of the Bars in PP and AF Packets at 75, 95% RH and 25, 35, 45 C. 260
7.3b Linear Plots of 'k' Values Using Acceptability Scores for Shelf-Life Estimation of the Bars in PP and AF Packets at 75, 95% RH and 25, 35, 45 C.

8.1 Illustrative Model for Formulation Development of Nutritionally-Balanced Snack Product.

8.2 Illustrative Model for Process Development of Nutritionally-Balanced Snack Product.

8.3 Illustrative Model for Sensory Analysis Development of Nutritional Product Development Process.


8.5 Framework of Systematic Nutritional Product Development Model for Thailand (NPD Model).

8.6 Process Flow Chart for Nutritionally-Balanced Snack Bar.

8.7 Nutritionally-Balanced Snack Product Developed for Urban School-Age Thais.
LIST OF APPENDICES

(M means in Microfiche at end of thesis,)
(others are in main thesis)

1.1 Phonetics for Thai Consonants and Vowels 297
1.2 Classification for Thai Snacks 298
1.3 Summary of Methods of Processing Snack Foods in Thailand 299

2.1M Selected Thai Snack Foods: Phonetics and English Defined M1
2.2M Character Notes for Appearance, Texture, and Flavour Used by the Thais M1
2.3M Chart of Sensory Test Method To Qualify Thai Snacks M1
2.4M Seasonal Availability of Fruits by Months M1
2.5M Formula, Process, and Quality Factors of Selected Thai Snacks in Different Classes M1

3.1 Detailed Responses from the 1st Survey 301
3.2 Verbatim Comments from the 2nd Survey 303
3.3 Detailed Responses from the 2nd Survey 305

3.1M Questionnaire for the 1st Survey M1
3.2M Questionnaire for the 2nd Survey M1
3.3M An Official Correspondence for School Cooperation M1
3.4M A Letter to the Teacher-Interviewer and the Interviewing Criteria and Procedure M1
3.5M A 'Thank You' letter for school cooperation M1

4.1 Cash Outflow and Cash Inflow over 8 Years of Product 1 308
4.2 Net Present Value for Product 1 at 16% Rate of Interest 309
4.3 Factor Descriptions and Rate Definition for Probability Evaluation Criteria 310

4.1M Detailed Characteristic Definition of Factors for Sequential Screening of Nutritionally-Balanced Snacks M2
4.2Ma The Reasons of Importance for Checklist Screening Factors M2
4.2Mb The Scores for Rating Checklist-Screening Factors M2
4.3Ma Representative Basic Recipe for Each Group of Preliminary Product Concepts
4.3Mb Raw Material Availability and Price in Bangkok Market
4.3Mc Reasons For Use of Banana or Mango in the Recipe
4.4M Comparison of Quality/Price Relationship of Snack Products on Bangkok Market
4.5Ma Sales Potential for the 3 Groups of Preliminary Product Concepts
4.5Mb Estimated Capital Investment Cost and Production Cost for 9 Preliminary Product Concepts
4.5Mc Cash Outflow and Cash Inflow over 8 Years (for 9 Preliminary Product Concepts)
4.5Md Net Present Value for 9 Preliminary Product Concepts at 16% Rate of Interest
4.5Me Comparison of the Nine Projects Studied by Profitability
4.5Mf Detailed Result of Profit-Ranking Using Different Methods of Discountings
4.6Ma Nutritive Value of Food Used as Main Raw Materials (in 100 Grams Edible Part)
4.6Mb Relative Stability of Nutrients under Various Conditions of the Process
4.6Mc Subjective Estimation of Nutrient Destruction
4.7M Probability Assessment for 9 Preliminary Product Concepts

5.1 Food Raw Material Compositions and Costs.
5.2a Identification of the Unit Processes and Descriptions of the Processings.
5.2b DSC-Banana Process
5.3 Detailed Descriptions of Z-Arm Mixer and NID Bar-Forming Machine
5.4a Detailed Results of Process Development Experimentation: EXP1.
5.4b Detailed Results of Process Development Experimentation: EXP2.
5.4c Detailed Results of Process Development Experimentation: EXP3.
5.4d Detailed Results of Process Development Experimentation: EXP4.
5.4e Detailed Results of Process Development Experimentation: EXP5.
5.4f Detailed Results of Process Development Experimentation: EXP6.
5.5 Predicted Sensory Attribute Scores at Various Mixing Times.
5.6 Procedure for Measuring Pressing Force Applied on Developed Presser & Cutter.
5.7 Sensory Evaluation of the Factory Product.
5.8a Prediction Equations from the Two Statistical Analysis Methods
5.8b Calculations for Selected Estimated Output Variable Values.
5.1M Detailed Second Defined Product Concept after an Application of the Findings from "Best-Estimate" Experiment.
5.2M Detailed Result of Experimental Trials for Appropriate Methods of Ingredient Preparations.
5.3Ma An Example of the LP INPUT DATA File
5.3Mb An Example of the LP OUTPUT File
5.4M Fruit & Nut Snack Survey.
5.5M Result of Property Test of Selected Binding Agents.
5.6M Detailed Result of the Experimental Trials on the Processings.
5.7M Process Alternatives for Nutritionally-Balanced Snack Bars by Combination Approach.
5.8M Details Concerning 'RIN GRAYASAHT' Factory.
5.9Ma An Example of Command of MINITAB Program for Stepwise Regression Analysis.
5.9Mb An Example of Command of SPSS Program for Stepwise Regression Analysis.
6.1a Taste Panel Form for the 1st Ideal Product Profile Generation.
6.1b Taste Panel Form for the 2nd Ideal Product Profile Generation.
6.1c Typical Taste Panel Form for DSC-Banana Using Linear Scaling.
6.2a Ratio Mean Profile of LP Reformulated Product by 1st Lab Panel.
6.2b Ratio Mean Profile of 1st Consumer Test Product by Child Consumer Panel.

6.3 Possible Ways for the Attribute Readjustment of the Product.

6.4a Descriptive Taste Panel Form for Preliminary Test of Stored Product.

6.4b Typical Taste Panel Form for Stored Product Using Segmented Scaling.

6.5 T-test Calculation for Comparison between Lab Panel and Consumer Panel.

6.6a Profiles of 1st consumer test product by 1st lab panels using three methods for analysing data (Fixed-ideal data).

6.6b Profiles of 1st consumer test product by 2nd lab panels using two methods for analysing data (Fixed-ideal data).

6.6c Profiles of LP formulated product by 1st lab panel using three methods for analysing data (Moving-ideal data).

6.6d Profiles of 1st consumer test product by 2nd lab panel using three methods for analysing data (Moving-ideal data).

6.7a Correlation Coefficients of Sensory Attributes of the 1st Consumer Test Product Using Ratio and Interval Data by Adult Consumer Panel in New Zealand (Fixed Ideal Data).

6.7b Correlation Coefficients of Sensory Attributes of the 1st Consumer Test Product Using Ratio and Interval Data by Adult Lab Panel in Thailand (Fixed Ideal Data).

6.8a Correlation Coefficients of Sensory Attributes of the 1st Consumer Test Product Using Ratio and Interval Data by Adult Lab Panel in Thailand (Moving Ideal Data).

6.8b Correlation Coefficients of Sensory Attributes of the 1st Consumer Test Product Using Ratio and Interval Data by Child Consumer Panel in Thailand (Moving Ideal Data).

6.9b Ratio Means and Standard Deviations for Product Profiles by Consumer Survey and Calculation of Reference C.V. Values.

6.9c Score Means and Standard Deviations for Ideal Product Profile by Lab Panel and Calculation of Reference C.V. Values.


7.1 Calculation of Chemical Scores by Two Methods.

7.2a Changes of Sensory Attributes of Stored Product.

7.2b Changes of Moisture Content of Stored Product.

7.2c Changes of Total Plate Count of Stored Product.

7.2d Diagrammatically Shown Changes of Product Attributes During Storage at Different Conditions.

7.3a Significant Difference in Sensory Attributes between Days of Storage by T-Test.

7.3b Significant Difference in Sensory Attributes between Conditions of Storage by T-Test.

7.4a Significant Effects and Significant Models of Sensory Attributes, Moisture Content and Total Plate Count in Storage by Yates' Method.

7.4b Significant Effects and Significant Models of Sensory Attributes, Moisture Content and Total Plate Count in Storage by Stepwise Regression Method.

7.5a 1st Set Data for Shelf-Life Estimation: 75% RH; 25, 35, 45 C.

7.5b 2nd Set Data for Shelf-Life Estimation: 95% RH; 25, 45 C.

7.6a Calculation of 'k' Values: 75% RH.

7.6b Calculation of 'k' Values: 95% RH.

7.7 Results of Further Sensory Inspection of Stored Product.

7.1M Preliminary Storage Trial on the 1st Consumer Test Product.

7.2M Temperature and Relative Humidity of Bangkok in 1985.

7.3M Taste Panel Scores During Storage: Individual and Mean Scores.

7.4M Calculation of Significant Effects by Yates' Method.
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5M</td>
<td>Factorial Analysis of Stored Products.</td>
<td>M4</td>
</tr>
<tr>
<td>7.6M</td>
<td>Regression Analysis of 'k' values.</td>
<td>M4'</td>
</tr>
<tr>
<td>8.1</td>
<td>Logic Diagram for the Development Activities of the Present NPD Project for Thailand.</td>
<td>368</td>
</tr>
<tr>
<td>8.2</td>
<td>Material Balance for the Bar Production.</td>
<td>370</td>
</tr>
<tr>
<td>8.3</td>
<td>Preliminary Raw Material Specification.</td>
<td>373</td>
</tr>
<tr>
<td>8.4</td>
<td>Product Costing (and Profit Estimation).</td>
<td>374</td>
</tr>
<tr>
<td>8.5</td>
<td>Distribution Channels in Thailand.</td>
<td>377</td>
</tr>
</tbody>
</table>