DEVELOPMENT OF

NUTRITIONALLY-BALANCED SNACK PRODUCT

FOR URBAN SCHOOL-AGE THAIS

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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.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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