

**Development of fruit based diabetic food formulations; mix
fruit spread, mix fruit cordial and tomato sauce**

By

SANDAMALI HAYASINTH WIJEKULASURIYA

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Declaration

The work describe in this thesis was carried out by me under the supervision of Dr.K.K.D.S. Ranaweera and a report on this thesis has not been submitted in whole or in part to any University or any other institution for another degree/diploma.

.....*S.H. Wijekulauriya*.....

S.H. Wijekulauriya

TABLE OF CONTENTS

Contents	page
Table of Contents	i
List of Tables	iv
List of Figures	vi
List of Plates	vii
Acknowledgement	viii
Abstract	ix
CHAPTER 1	
INTRODUCTION	
1.1 General Introduction	1
1.2 Objective of the Study	5
1.2.1 General objectives	5
1.2.1 Specific objectives	5
CHAPTER 2	
REVIEW OF LITERATURE	
2.1 A flashback of Processed Fruit processing industry	6
2.1.2 Background	7
2.1.2 Significance of fruit processing	7
2.1.3 Fruit processing technologies in Sri Lanka	8
2.1.4 Jams and Fruit spreads	8
2.1.5 Fruit Cordials	11
2.1.6 Tomato sauce	13
2.2 Botanical Background of fruits	15
2.2.1 Pineapple	15
2.2.2 Papaw	17
2.2.3 Mango	20
2.2.4 Tomato	22
2.3 Diabetes and its control measures.	26
2.3.1 Introduction	26
2.3.2 History	26
2.3.3 Definition of diabetes	27
2.3.4 Significance of processing diabetic fruit products	30

2.4	Artificial sweeteners or sucrose substitutes	33
2.4.1	History of development of artificial sweeteners	33
2.4.2	Introduction to artificial sweeteners	34
2.4.3	Polyhydric alcohols	34
2.4.4	High intensity Sweeteners	35
2.4.5	Why sucralose	39

CHAPTER 3 METHODOLOGY

3.1	Development of mix fruit spread	41
3.1.1	Raw material and Equipment	41
3.1.2	Method	42
3.1.3	Processing steps for development of diabetic mix fruit spread	44
3.1.4	Formulations for diabetic mix fruit spread	45
3.2	Development of diabetic mix fruit cordial	45
3.2.1	Raw material and Equipment	45
3.2.2	Method	46
3.2.3	Processing steps for development of mix fruit cordial	48
3.2.4	Formulations for diabetic mix fruit cordial	49
3.3	Development of diabetic tomato sauce	49
3.3.1	Raw material and Equipment	49
3.3.2	Method	50
3.3.3	Processing steps for development of tomato sauce	52
3.3.4	Formulations for diabetic tomato sauce	53
3.4	Proximate Analysis of Fruit based products	54
3.4.1	Determination of moisture	54
3.4.2	Determination of Ash	55
3.4.3	Determination of Total fat	56
3.4.4	Determination of protein	58
3.4.5	Determination of Fiber	60
3.4.6	Determination of Carbohydrates	62
3.5	Chemical Analysis of fruit based diabetic products	63
3.5.1	Determination of reducing and total sugars	63
3.6	Determination of pH	67
3.7	Determination of Total Soluble solids	67
3.8	Determination of caloric values	67

3.9	Sensory evaluation of diabetic fruit based products	68
3.9.1	Preference test -Hedonic scale	68
3.9.2	Difference test -Multiple comparison	69
3.10	Microbiological Analysis of Diabetic fruit based products	71
3.10.1	Total plate count	71
3.10.2	Total fungal and yeast count	72

CHAPTER 4

RESULTS AND DISCUSSION

4.1	Developed formulations for diabetic fruit based products	74
4.1.1	Developed formulations for diabetic mix fruit spread	75
4.1.2	Developed formulations for diabetic mix fruit cordial	75
4.1.3	Developed formulations for diabetic tomato sauce	76
4.2	Proximate Analysis	77
4.2.1	Proximate Analysis of diabetic mix Fruit spread	77
4.2.2	Proximate Analysis of diabetic mix Fruit cordial	80
4.2.3	Proximate Analysis of diabetic tomato sauce	83
4.3	Proximate Composition of the diabetic fruit based products	86
4.4	Chemical Analysis	87
4.4.1	Determination of Total sugars	87
4.5	Determination of Carbohydrates	88
4.6	Determination of caloric values and sugar contents	88
4.7	Determination of pH and Brix	90
4.8	Sensory evaluation	91
4.8.1	Sensory properties of diabetic mix fruit spread	91
4.8.2	Sensory properties of diabetic mix fruit cordial	92
4.8.3	Sensory properties of diabetic tomato sauce	94
4.9	Results of Microbial Analysis	96
4.10	Recommendations on product technical data	97
4.11	Comparison of product technical data with available standards	98

CHAPTER 5

CONCLUSION

100

REFERENCES

104

APPENDICES

106

List of Tables

Table 2.1	Composition of pineapple fruit (Use in Sri Lanka)	16
Table 2.2	Composition of Inorganic constituents of pineapple fruit	17
Table 2.3	Composition of papaya fruit (Use in Sri Lanka)	19
Table 2.4	Composition of Inorganic constituents of papaya	20
Table 2.5	Composition of Mango (Use in Sri Lanka)	21
Table 2.6	Composition of Inorganic constituents of Mango	22
Table 2.7	Composition of Tomato	24
Table 2.8	Composition of Inorganic constituents of Tomato	25
Table 3.1	Formulations for diabetic mix fruit spread	45
Table 3.2	Formulations for diabetic mix fruit cordial	49
Table 3.3	Formulations for diabetic tomato sauce	53
Table 4.1	Moisture % in mix fruit spread	77
Table 4.2	Ash % in mix fruit spread	77
Table 4.3	Total fat % in mix fruit spread	78
Table 4.4	Fiber % in mix fruit spread	78
Table 4.5	Protein% in mix fruit spread	79
Table 4.6	Moisture % in mix fruit cordial	80
Table 4.7	Ash % in mix fruit cordial	80
Table 4.8	Total fat % in mix fruit cordial	81
Table 4.9	Fiber % in mix fruit cordial	81
Table 4.10	Protein% in mix fruit cordial	82
Table 4.11	Moisture % in tomato sauce	83
Table 4.12	Ash % in tomato sauce	83
Table 4.13	Total fat % in tomato sauce	84
Table 4.14	Fiber % in tomato sauce	84
Table 4.15	Protein% in tomato sauce	85
Table 4.16	Proximate composition in diabetic fruit based products	86
Table 4.17	experimental data for total sugar in low caloric fruit based food formulations	87
Table 4.18	Results of carbohydrates in diabetic fruit based products	88

Table 4.19	Caloric Values of fruit based diabetic food products	88
Table 4.20	pH and Brix of fruit based diabetic food products	90
Table 4.21	Probability values and mean scores of sensory evaluation of diabetic mix fruit spread	91
Table 4.22	Probability values and mean scores of sensory evaluation of diabetic mix fruit cordial	93
Table 4.23	Probability values and mean scores of sensory evaluation of diabetic tomato sauce	94
Table 4.24	Results of Microbial Analysis in fruit based diabetic food products	96
Table 4.25	Recommendations on product technical data	97
Table 4.26	Comparison of product technical data with available standard	98

List of Figures

Figure 3.1	Production flow diagram of Diabetic mix fruit spread	44
Figure 3.2	Production flow diagram of Diabetic mix fruit cordial	48
Figure 3.3	Production flow diagram of Diabetic tomato sauce	52

List of plates

Plate 4.1	Prepared fruit based diabetic products	74
Plate 4.2	Prepared diabetic mix fruit spread	75
Plate 4.3	Prepared diabetic mix fruit cordial	75
Plate 4.4	Prepared Diabetic tomato sauce	76

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ABSTRACT

Development of Diabetic fruit based food formulations

by

S.H. Wijekulasuriya

Availability of processed diabetic fruit products with the healthier sucrose substitutes is limited in Sri Lanka but the demand for the convenience diabetic fruit based products is ever increasing.

Hence the study was carried out to identify the possibility of substituting sucrose with a healthier non- sugar intense sweetener and thereby develop the diabetic mix fruit spread, diabetic mix fruit cordial and diabetic tomato sauce. Sucralose is the high intensity sweetener selected for developing diabetic fruit based food formulations.

Mix fruit spread and mix fruit cordial were developed using, Papaw (*Carica papaya*) Pineapple (*Ananas comosus*) and Mango (*Mangifera indica*). Fresh fruit pulp was used with sucralose, pectin, citric acid and Sodium benzoate and the consistency of the fruit spread was achieved at 10° Brix TSS at the temperature of 98°C. Fresh fruit pulp (74%) was used with sucralose (520ppm), citric acid (0.5%), and Sodium benzoate (400ppm) and the consistency of the mix fruit cordial was achieved at 10° Brix TSS at the temperature of 98°C. In these diabetic food formulations preservation has been achieved by using Sodium benzoate, Sodium Meta bisulphate and high acidic conditions. The product was sensory analyzed using multiple comparison tests and the diabetic mix fruit formula was statistically similar to the branded diabetic product. The overall acceptability of both fruit cordials with sugar and diabetic mix fruit cordial were similarly scored according to the hedonic scale test.

The diabetic tomato sauce is developed using tomato pulp (88.45%), Sucralose (520ppm), and Sodium benzoate (250ppm). The product consistency was achieved at total soluble solids 18 ° Brix. The mean values of overall acceptability was in liked very much level for diabetic tomato sauce.

The nutritional facts of the diabetic mix fruit spread and mix fruit cordial indicated that one serving contained 10 calories, and less than 1.52 of sugars and diabetic tomato sauce contained 5.5 calories and less than 0.4 g of sugars per serving. According to the code of federal regulations, CFR 101 (2002), all the three products can be claimed as low sugar and low caloric products. And according to the American Diabetic Center reference statistics all the three diabetic products can be claimed as calorie free and carbohydrate free.

CHAPTER 1

INTRODUCTION

1.1 General Introduction

As far as the man is concerned, the intimacy existed between primitive man and food has been an obligatory phenomenon, which provided primary means of sustenance as equally as the dependence on oxygen for their life, if otherwise, the whole life on the earth would not have been possible.

Since the ancient times the man tended to preserve excess food for their future uses resorting to various preservative techniques in case of any possible scarcity. Hence processing of fruits in the form of jams and fruit spreads, cordials and squashes and sauces and ketchups were originated.

With the rapid modernization of the world and those modern competitive lifestyles of house holders, they eventually move towards the convenience food types. With the above mentioned phenomena processed fruit industry increasingly become popular among consumers.

All the processed fruit products, namely jams and fruit spread, cordial and squashes and sauces contain considerable amount of available carbohydrates and sugars.

In former times, people rarely got as much energy as they actually needed. However, since the 1960's this situation has radically changed, and people tend to consume more than optimum intake levels and use too much fat and sugar, whilst complex carbohydrates and fibers accounted for less amount than required.

In our affluent society, high sugar foods have always been a temptation. In fact humans and other mammals have an innate preference for a sweet taste and, as it is a genetically determined inheritance, even the best arguments will sometimes be insufficient to persuade us not to enjoy that sweet treat.

Thus, this criteria of consume high sugar containing foods have result in adverse effects in health in modern life styles and people increasingly consider more towards the sugar free and low calorie processed foods.

Low calorie foods were originally targeted to specific consumers with health issues such as diabetes, but their use has expanded to disease prevention, to weight control and to fit with in the pattern of a healthier diet and lifestyle. (Arvanitoyannis and Sandrou, 2000)

Diabetic and obesity have become major health issues in modern society and where people tend to find solutions to avoid the high sugar and calorie content but to keep the sweet sensation in their diets without adverse health conditions.

One of the major methods to manage diabetes is by controlling the total dietary carbohydrate and calorie intake. High intensity sugar substitutes do not break down to glucose and thus do not cause hyperglycemia. Consequently, foods formulated with high intensity sweeteners can be used to manage diabetes mellitus. (Nelson, 2000)

Low-calorie sweeteners are the only means of giving food a sweet taste without increasing its calorie content. A broad variety of low-calorie products is now available to those consumers who do not wish to make any compromises regarding taste while maintaining a balanced diet low on calories. Low-calorie sweeteners therefore contribute towards consumer choice.

Hence it has become a significant event in the fruit processing industry to introduce products with sugar and calorie free and without any aftereffects by substituting the sucrose with most health friendly sucrose substitute or artificial sweetener.

Several number of artificial sweeteners use in the food industry. Only limited number of artificially sweetened processed fruit products available in Sri Lanka namely diabetic jams.

Diabetic or low calorie fruit based processed food products are a new dimension in food processing technology in Sri Lanka.

From those available products also creates a caution of their health friendliness and some of they are not truly calorie free though they claim as calorie free. In Sri Lankan food industry aspartame and sorbitol is widely use but according to the recent published research data aspartame is not the best substitute for sucrose when consider is effects to the health as well sorbitol is not a calorie free compound and has some bad health effects for the regular intake.

In this study, Sucralose was identified as the currently available most health friendly sucrose substitute to use in the processed fruit product formulations by reviewing the literature.

Pineapple, Papaw, Mango is used in diabetic mix fruit cordial and diabetic mix fruit spread formulas and tomato is used for sauce formulation. In Sri Lanka 40 % of the fruits are wasted during the harvesting seasons as a consequence of expiry due to out dating and spoilage due to over ripening. However in a period of the year it shows a large market vacuum. Sri Lankan fruit processing industry only accounted for 10 % from the fresh fruit production in the country which is supposed to be a significantly low amount.