JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Development and Analysis of Probiotic Vegan Shrikhand from Cocus nucifera (Coconut) Milk.

Darshilsinh H Thakor[1], Prof. Nisha M Wagh[2]
Department of Food Technology[1, 2]
Parul Institute of Applied Science, Parul University, Waghodia, Gujarat, India

Abstract: The study of Development of probiotic vegan shrikhand from coconut milk incorporated with custard apple was carried out at the Department of Food Technology, Parul Institute of Applied Sciences, Parul University, Vadodara. The main objective of the study was to develop a new variety of shrikhand for people following vegan diet and can be consumed for preventing heart disease, helps in losing weight and can be served to lactose intolerance group of people with minor or no symptoms .Coconut milk shrikhand was prepared from extracting out milk from coconut. Custard apple was used as a source of flavours in preparation of vegan shrikhand. The vegan shrikhand was prepared using coconut milk, agar, probiotic starter culture (*Lactobacillus acidophilus, Lactobacillus Rhamnosus, Bifidobacterium Bifidum, Bifidobacterium Longum, Streptococcus thermophilus*), sugar and custard apple. Four formulations of shrikhand were prepared (T0, T1, T2 and T3) with different formulations of sugar (35%, 35%, 40% and 45%) and custard apple pulp (0%, 5%, 10% and 15%). In (T0) control sample was prepared without the addition of custard apple pulp. The analysis was further carried out by the physical chemical and microbiological characteristics. Probiotic vegan shrikhand with T1 formulation with 35% sugar and 5% custard apple pulp was seen to be the best on the basis of sensory evaluation like taste, texture, smell, colour and overall acceptability. The selected shrikhand was evaluated for physicochemical, microbial and sensory properties. The final product contained 57.56% moisture, 6.4% fat and 1.6% protein.

Keywords: **Coconut milk, probiotics, custard apple, vegan, shrikhand.**

I. INTRODUCTION

Shrikhand is a locally produced fermented milk product made from milk with the use of processes like coagulation, desiccation, and fermentation. Shrikhand is frequently served as a dessert after meals. In India, it is often consumed as a festival treat. Sugar is a flavour enhancer that is added to Shrikhand; it has no preservation properties. The flavour of shrikhand is improved by the addition of other organic ingredients, such as dried fruits. In western India, shrikhand is usually prepared at home. The Sanskrit text "Shikharini" from which the

name shrikhand is derived. A big collection of advantageous bacteria that share characteristics and all end up producing lactic acid as part of the fermentation process is referred to as a lactic acid bacterium. (Swapna, 2013)

Shrikhand is one of the most well-liked fermented milk products due to its flavour and medicinal benefits. Shrikhand is made by fermenting lactic acid with the help of Lactobacillus acidophilus, Lactobacillus rhamnousus, Bifidobacterium bifidum, Bifidobacterium longum and Streptococcus thermophilus.

Custard apple pulp has a somewhat granular texture, is creamy yellow or white, sweet, and has a low acidity. It is thought to be the sweetest Annona fruits. The edible component accounts for 28-37% of the total fruit weight, with seeds accounting for the remaining 23-40%.The pulp contains carbohydrates such as fructose, sucrose, glucose, and oligosaccharides (Kumhar, 2014).

Agar, a plant-based, gel-like product derived from red algae, is an excellent vegan substitute for gelatin. Agar is primarily utilised as a gelling agent and secondary as a binding agent. In the human food industry, it is used as a stabiliser and to control viscosity. It is used in the confectionery industry to manufacture candies, marshmallows, and jellies (Yudkin, 1986).

Coconut milk refers to the liquid made by manually or mechanically extracting grated coconut meat, either with or without the addition of water. Both coconut cream and coconut milk are commonly used interchangeably. However, coconut milk alludes to the Coconut cream is the high-fat, cream-like material that is recovered from the coconut milk by either gravity separation or centrifugation. It is freshly separated from the coconut kernel with or without the addition of water (Banzon, 1990).

Probiotics are live microorganisms which when provided in suitable proportions confer a health benefit on the host". Lactic acid bacteria are utilised in the manufacturing of dahi, shrikhand, mishti dahi, lassi, buttermilk, and yoghurt as starters. The bacteria that produce lactic acid are naturally GRAS (generally recognised as safe) for human use. Lactobacillus bacteria are widely utilized in medicine to modify immunity, enhance digestion, prevent cancer, and improve lactose intolerance, among other things (Makhal, S., Mandal, et. al., 2005).

Probiotic vegan shrikhand was prepared from coconut milk and other ingredients. The evaluation was carried out on numerous shrikhand samples (T0, T1, T2, T3) containing different amounts of sugar (35%, 35%, 40%, 45%) and custard apple pulp (0%, 5%, 10%, 15%). Coconut milk was fermented using probiotics (Lactobacillus acidophilus, Lactobacillus Rhamnosus, Bifidobacterium Bifidum, Bifidobacterium Longum, Streptococcus thermophilus) bacteria. To complete this product development experiment organoleptic, chemical and microbiological quality analysis were performed.

II. MATERIALS AND METHODOLOGY

2.1 Materials

The research work was conducted in the Food Processing Laboratory, at Parul Institute of Applied Science, Parul University, Vadodara, Gujarat.

2.1.1 Raw Material required for studies

The raw materials required for the preparation of vegan shrikhand were Coconut milk, custard apple pulp, Probiotic starter culture, Agar-agar, Sugar, Almonds and Pistachio purchased from the local market.

2.1.2 Processing Equipments

Processing equipment is any machinery used to raise the value of a raw material or finished goods by physical or chemical techniques. The equipments used are Mixer Grinder, weighing scale, digital thermometer, Muslin cloth, spoons, vessels and refrigerator.

2.2 Method

2.2.1 Preparations of probiotic vegan shrikhand from coconut milk

Vegan shrikhand was prepared by using coconut milk with different proportions of sugar (35%, 35%, 40%, and 45%) and custard apple pulp (0%, 5%, 10%, and 15%). Here after samples are referred as T0, T1, T2 and T3 respectively. Here in preparation of all the samples the coconut milk is heated at very low flame at 80-90°C for 5-6 minutes. Agar is added to coconut milk while it is being heated while the milk is being stirred constantly. Then the milk was cooled down to 40-45°C and after cooling probiotic vegan starter culture was added containing species like (Lactobacillus acidophilus, Lactobacillus rhamnousus, Bifidobacterium longum, Bifidobacterium bifidum and Streptococcus Thermophilus). After a while it was kept for incubation at 30-32°C for 10-12 hours till desired curd is formed. Curd is tied and hanged in muslin cloth till all water drains out from the curd and we get is chakka. Weight of chakka is collected and as per different samples T0, T1, T2 and T3 sugar and pulp is added to chakka. After adding sugar and custard apple pulp to chakka as per formulations it is mixed/whipped properly. Before packing shrikhand the glass jars were washed and sterilized. The final product was packed and stored at 4°C until used.

Coconut Milk
↓
Heating (at 80-90°C for 5-6 minutes)
↓
Stirring & Adding Agar While Heating
↓
Cooling (40-45° C)
↓
Addition of probiotics starter culture
↓
Incubation (at 30-32°C for 10-12 hours)
↓
Curd formation
↓
Draining out water by tying and hanging curd with muslin cloth
↓
Chakka
↓
Adding sugar and custard apple pulp.
↓

Mixing / whipping
↓
Adding almond and pistachio (for Garnishing)
↓
Shrikhand

2.2.1.1: Flowchart of preparation probiotic vegan shrikhand from coconut milk

Table 2.2.1.1: Formulations of vegan shrikhand

Ingredients	T0	T1	T2	T3
Coconut milk	100ml	100ml	100ml	100ml
Agar	4gm	4gm	4gm	4gm
Grinded Sugar	35gm	35gm	40gm	45gm
Custard apple pulp	0	5gm	10gm	15gm
Starter Culture (Tablet)	1	1	1	1

Note: 1 Tablet of probiotic culture contains 0.7 billion % of each species values based on 2320 calories diet.

2.3 Organoleptic Analysis

A study where items or food categories are randomly chosen and the level of satisfaction is measured using a hedonic scale. The hedonic scale, an organoleptic measurement, enables the judge to express his degree of preference. An overall Hedonic scale of nine points was used for the tests. The following were graded using the organoleptic Hedonic scale in its general form: 1. Dislike extremely, 2. Dislike very much, 3. Dislike moderately, 4. Dislike slightly, 5. Neither like nor dislike, 6. Like slightly, 7. Like moderately, 8. Like very much, 9. Like extremely. Appearance, colour, texture, taste and overall acceptance tests of the samples were tested. These tests were carried out by the teachers of Department of Food Technology, Parul University, Vadodara, Gujarat.

2.4 Chemical Analysis

Chemical Analysis of the most liked sample was carried out. Protein was determined using Kjeldahl method, moisture was determined using hot air oven drying, total ash was determined by incineration method and fat was determined by Roese-Gottileb Method.

2.5 Microbial Analysis

Microbiological tests for total plate count (TPC), total coliform count (TCC), E. coli count, and total yeast and mould count (TFC) were performed in accordance to Indian standard methods for the evaluation.

III. RESULTS AND DISCUSSIONS

3.1 Organoleptic Analysis of different type of prepared shrikhand

Organoleptic analysis of prepared shrikhand is done on its appearance, taste, texture, colour and overall acceptability of samples. Table: 3.1.1 shows the comparison of prepared shrikhand of their organoleptic quality factors.

Table: 3.1.1 Comparison of Organoleptic Qualities of Different Formulation of Shrikhand samples

Constituent	T0	T1	T2	T3
Appearance	7.3	8.3	8.1	7.6
Colour	6.6	8	8	7.6
Texture	7.6	8.3	7.9	8
Taste	8	8.6	8.1	7.6
Overall Acceptability	7.37	8.3	8	7.7

3.1.1 Appearance

The physical assessment and aesthetic appeal of every variant of prepared shrikhand were shown in Table 3.1.1. The average appearance score of T0, T1, T2 and T3 prepared shrikhand samples was 7.3, 8.3, 8.2 and 7.7, respectively. The T1 sample of prepared shrikhand received the highest appearance score. The hedonic scale revealed that all types of Shrikhand samples were appreciated very highly (>7) by the judge in the appearance acceptability test, as shown in Table: 3.1.1

3.1.2 Colour

Table 3.1.1 demonstrates how several varieties of formulated shrikhand were compared in terms of colour and given a physical score. The average colour score of prepared shrikhand samples T0, T1, T2, and T3 was 6.6, 8, 8, and 7.6. Samples T3 and T0 received the highest and lowest scores, respectively. The colour of the shrikhand is determined by the proportion of pulp of a custard apple.

3.1.3 Texture

Table 3.1.1 demonstrates how several varieties of formulated shrikhand were compared in terms of texture and given a physical score. The average texture score of prepared shrikhand samples T0, T1, T2, and T3 was 7.6, 8.3, 8.6, and 8. Samples T3 and T0 received the highest and lowest scores, respectively. The texture of the shrikhand is determined by the proportion of grinded sugar.

3.1.4 Taste

Table 3.1.1 demonstrates how several varieties of formulated shrikhand were compared in terms of taste and given a physical score. The average taste score of prepared shrikhand samples T0, T1, T2, and T3 was 8, 8.6, 8.1, and 7.6. Samples T3 and T0 received the highest and lowest scores, respectively. The taste of the shrikhand is determined by the proportion of grinded sugar and pulp of a custard apple.

3.1.5 Overall Acceptability

The quality of the raw components used in the preparation of prepared shrikhand also influenced consumer acceptability. The physical score for the general acceptance of many variants of prepared shrikhand is shown in Table 3.1.1 and Figure 3.1.5.1. The average overall taste score for prepared shrikhand samples T0, T1, T2, and T3 was 7.37, 8.3, 8.2, and 7.7, respectively. According to the hedonic scale, the T1 prepared sample outperformed the T0, T2, and T3 samples. According to the sensory examination, shrikhand with up to 35% sugar and 5% custard apple pulp was satisfactory. Eventually, the study found that the T1 (35% sugar, 5% custard apple pulp) sample was chosen and accepted by the panellists.

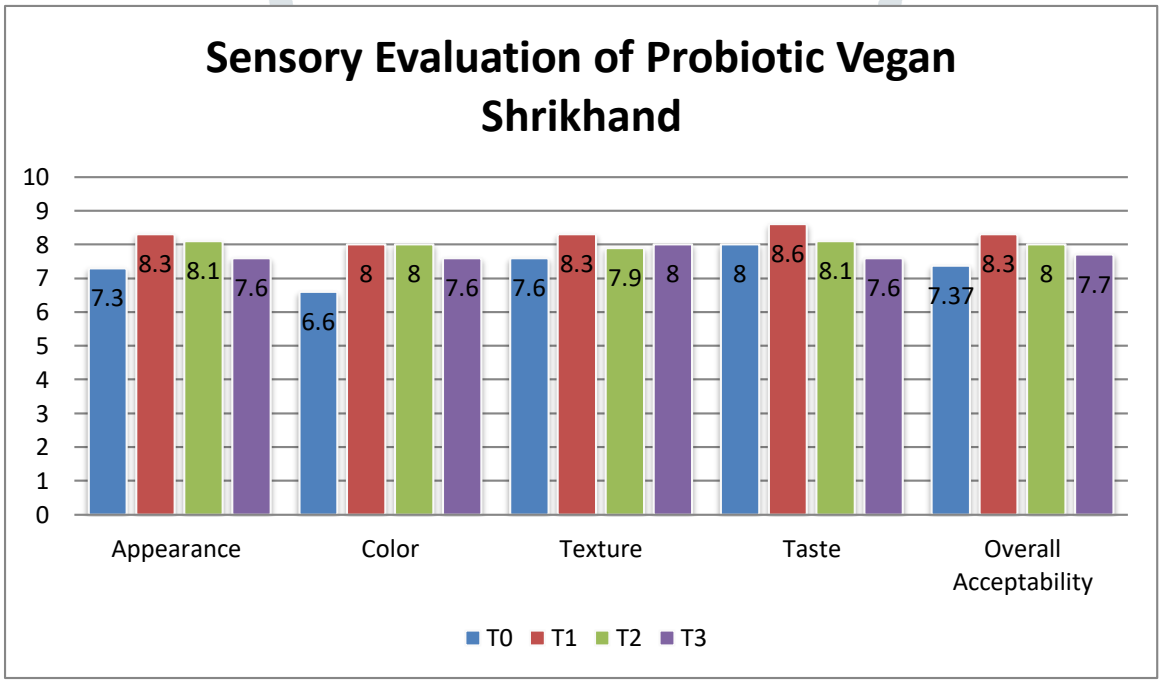

Figure 3.1.5.1: Comparison of different type of vegan shrikhand

Based on sensory evaluation using a 9 hedonic scale, the shrikhand made with the addition of 35% sugar and 5% custard apple pulp (T1) received the highest score in overall acceptability from the judges. So the T1 sample was selected for proximate analysis.

3.2 Physico-Chemical Analysis of prepared vegan shrikhand

Chemical composition of prepared shrikhand is given in Table 3.2.1. Moisture, protein, fat, ash, sample was analysed for their chemical qualities.

Table: 3.2.1 Chemical Composition of Vegan Shrikhand.

Sr. No.	Quality Characteristics	Units	Results
1.	Moisture	%	57.56
2.	Total Ash	%	0.27
3.	Fat	g/100g	6.40
4.	Protein	g/100g	1.6
5.	Carbohydrate	g/100g	37.17
6.	Energy	Kcal/100g	185.68
7.	Lactose	%	4.8

3.3 Microbiological analysis of vegan shrikhand

In this study 4 different tests Total Plate Count, Yeast and Mould Count, E.coli Detection and Total Coliform Count were conducted to analyse the microbiological quality of prepared shrikhand sample. Microbial composition of prepared shrikhand is given in Table 3.3.1

Table: 3.3.1 Microbial composition of shrikhand

Sr. No.	Quality Characteristic	Units	Results
1.	Total Plate Count	Cfu per g	1,59,000
2.	Yeast and Mould Count	Cfu per g	900
3.	Total Coliform Count	Per g	Absent
4.	Escherichia Coli (Detection)	Per g	Absent

IV. CONCLUSION

Based on sensory, chemical and microbiological examination, the study was conducted with different sample formulations of sugar (35%, 35%, 40% and 45%) and custard apple pulp (0%, 5%, 10% and 15%). The appearance, colour, taste, and texture of shrikhand with 35% sugar and 5% custard apple pulp was preferred then other samples, according to a 9 point hedonic scale of organoleptic qualities. According to the results obtained T1 was the most effective sample out of all formulations with different amounts of sugar and custard

apple pulp which contains Energy 185.68 Kcal, fat 6.40%, Protein 1.6% and Ash 0.27%. The safety of all products is further ensured by microbiological quality measures, and in the case of total plate count, yeast and mould count, and total coliform count, these values were within permissible limits. So, all of the shrikhand samples that had been created were safe to eat. From the above research it can be concluded that the developed vegan probiotic shrikhand can be consumed by normal peoples as well as peoples with vegan diet.

REFERENCES

1. Afodunrinbi, A. T. and Onyeukwu, G. C. (2000). Yoghurt from coconut and tiger nuts. Afr. J. Appl. Bacteriol. 75, 95-107.
2. Banzon, J. A. (1990). The coconut palm and its fruit. In: "Coconut as Food". (J. A. Banzon, O. N. Gonzalez, S. Y. Leon and P. C. Sanchez, Eds.). pp. 3-7. Quezon city, Philippines. Philippines Coconut Research and Development of Food Technology.
3. Seow C. C. and Gwee C. N. (1997). Coconut milk: chemistry and technology. Int. J. Food Sci. Technol. 32 (3), 189-201
4. Swapna G., & Chavannavar S. V., (2013). Shrikhand-Value added traditional dairy product. International Journal of Food and Nutritional Sciences, 2(4), 45-51.
5. Kumhar D. S., Pareek S. & Ameta K. D. (2014). Effect of antioxidants and storage temperatures on browning and quality of custard apple (Annona squamosa L.) pulp.
6. Yudkin, J., 1986. The Penguin Encyclopaedia of Nutrition. Penguin Books, Harmondsworth, UK.