Incorporation Of Defatted Soyaflour In Snacks Sold In Three Theatre Canteens

BY

T. S. SIVA PRIYA

A THESIS SUBMITTED TO THE AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN (DEEMED UNIVERSITY) COIMBATORE - 641 043

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE IN FOOD SERVICE MANAGEMENT AND DIETETICS

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Certified as Bonafide Research Work.

Signature of the Head of the Department	Signature of the Dean of the Faculty	Signature of the Guide

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Introduction

INTRODUCTION

Health of the people is the most essential factor in national development. Man needs a wide range of nutrients to perform various functions in the body and to lead a healthy life. Malnutrition is a state of improper nutrient balance in the body. In developing countries, 1156 million people live in absolute poverty, 212 million more than in 1970 (Mathew, 1994).

Malnutrition aggrevates the clinical course of many infectious diseases (Gopalan,1991). The most identified causes of malnutrition are faulty food habits, poverty, large size of the family, defective food intake, ignorance, religious beliefs and indifference.

Malnutrition occurs when protein and energy requirement is not met which is mainly due to their socio-economic status. Of the different forms of protein available namely, plant and animal protein, animal protein is of higher biological value and highly digestible (Goranov, 1992). But lower economic group of people are unable to purchase foods rich in animal protein.

To alleviate this condition, efforts are undertaken to introduce alternatives or rather, other protein supplements which have the same biological value as animal protein. One

such product is the soya protein. It is one of the cheapest source of protein available today.

Of all the plant proteins, soya bean is the richest source containing over 40 per cent protein, 20-22 per cent good quality oil and 19-21 per cent fat (Kataria, 1991). The quality of protein present in soya is better than other pulse protein and can be equated to that of meat proteins. It contains twice as much protein than the expensive common pulses like red gram, black gram, green gram and bengal gram which can be replaced partly or totally by soya.

Nutrition surveys carried out in many developing countries have shown that the diets consumed by a large majority of the population are based mainly on cereals, roots and tubers and contain small amounts of legumes and vegetables and negligible amounts of milk, meat, fish and eggs (Swaminathan, 1993).

The main source of protein for Indian people is of vegetarian origin. The protein deficiency problem prevalent among vegetarian people in India could be solved partly by the use of soya bean as a food. Thus soya bean has now emerged as an important crop with a potential to narrow down the oil and protein gap (Kataria, 1991).

Today as the importance of soya has been realised, soya is being used to fortify food items in many countries. It is used commonly in infant formulae, break fast cereals, snacks, meat products and the like in variety of combinations and compositions.

Soya flour has been a valuable source of protein in the dietaries of population groups of China, Japan and U.S.A (Fox et al., 1984). In India only now awareness has been kindled as to the usefulness and significance of the use of soya protein and efforts have been taken to incorporate soya in the daily diet of every individual. One tablespoon of soyaflour in our daily diet gives 8 grams of protein. The high protein content and high yielding capacity of soya has proved fruitful in the healing of several diseases as well as improved general body mechanisms (Sakthi Soyas).

In India, amongst the lower economic groups, viewing cinemas in theatres is the most common form of entertainment for workers to spend their leisure hours after a day's strenuous work. People from all walks of life stalk the theatres. Snacks are sold in theatre canteens for the people and most of them visit the snack bars during intermission. Incorporating soyaflour in the snacks and other food items would be an efficient and economic way of improving the protein content of the product. Addition of even 10 per cent

soyaflour to the snacks will enhance the nutritional quality.

Realising the importance of improving the nutritional quality of traditional snacks sold in the theatre canteens, the present study was undertaken with the following objectives: To,

A) select two suitable recipes sold in theatre canteens for incorporating soyaflour;

B) standardise the recipes;

C) evaluate the standardised recipes and

D) assess clientele accetability of the soya incorporated recipes.

Review of Literature

II. REVIEW OF LITERATURE

Review of Literature pertaining to the topic "Incorporation of Defatted Soyaflour in Snacks Sold in Three Theatre Canteens" is presented under the following headings:

A) Protein Gap in Indian Dishes

B) The Wonder bean - Soyabean

C) Nutritional Improvement of Snacks with Protein Rich Soyaflour

D) Acceptability of Soya Products

A) Protein Gap in Indian Dishes

Individuals may get enough calories but insufficient amount of needed nutrients such as minerals, vitamins and proteins or some of the critical aminoacids in the proteins. As a result of food deficits, nearly 1000 million people do not get enough to eat and 400 million people are chronically malnourished (Sadik, 1991).

Malnutrition is one of the important factors in influencing the intelligence apart from socio-economic status of the family (Nutrition News, 1990). In India, hunger and malnutrition contribute to about 40-50 per cent of the child deaths (ICMR Bulletin,1994). The prevalence rate of severe degree of protein energy malnutrition in the community is 3-5 per cent. For every 3 to 5 cases of the severe protein-energy malnutrition, we can detect 80 to 90

cases of mild to moderate protein-energy malnutrition and about 10 per cent of well-nourished children (India, 1993).

Presently, the nutrition experts have begun to realise the need of implementing practical measures to alleviate malnutrition rather than identifying the etiology alone. In India, most Indians consume foods that provide more carbohydrates and fats than proteins (Mathew, 1993).

B) The Wonder Bean - Soyabean

Soyabean which consists of approximately 40 per cent protein and 20 per cent oil with good source of phosphorus and lecithin hold a great promise to meet the present day nutritional requirement of population groups (Shah, 1985).

Soyabeans appear to be a practical contribution to solving India's malnutrition problem (Jain, 1988). Exploitation of soya bean for supplementing the cereal based diet can help in combating the problem of protein calorie malnutrition.

Soya proteins are considered to be comparable to animal proteins in their nutritive nature except for low methionine. Therefore soyabean is often referred to as meat for vegetarians (Shah, 1985).

For centuries, the Chinese have called soya bean as the 'Golden bean', 'Yellow jewel', 'Great treasure', 'Cindrella crop' and 'Chinese cow' is a boon to solve protein malnutrition (Vaidehi et al., 1985).

The problem of protein-calorie malnutrition first drew attention to the fortification of bread and other cereal products with protein rich materials. soyaflour is a cheap and nutritious supplement to wheat flour as it provides protein with improved aminoacid balance (Awasthi, 1993). Recently, worldwide attention has been paid to soyabeans as an economical and quality protein source (Fukushima, 1991).

As a protein source, soyabean contributes two-third of the world's consumption of protein grains. It is also the major source of oil providing for one-third of the world's consumption by man (Goranov, 1992).

Soyabean is one of the cheapest sources of high quality protein available today and it is likely to supercede other pulse crops rapidly (Jayalakshmi and Neelakantan, 1987).

Beans are consumed as food in developing countries were animal protein is scarce or expensive or is not consumed for religious or cultural reasons (Saharan and Khetarpaul, 1994).

C) Nutritional Improvement of Snacks with Protein Rich Soyaflour

The past 30 years period saw the application by Government of the principles of nutrition to mass feeding (Lawson et al., 1988).

Soyabeans contain one and a half times more vegetable proteins than cheese, twice as much as meat or fish, 3 times as much as eggs and 11 times as much as milk (Financial Express, 1992). Hence soyaflour can be incorporated which is ideal for making snacks or fast food.

Soya can be blended well with cereals, millet or legume flour to prepare traditional Indian snacks (Financial Express, 1992). In early 20th century when the importance of proteins in human diet began to be understood, soyabean was found to contain more protein than beef, a common source of animal protein in the western diet (Joshi, 1992). Edible soyaflour is the best proteinaceous source in all respects and it can easily replace partially or fully the costly pulse dhals of red gram, black gram, bengal gram and green gram. These pulse dhals contain only 18-20 per cent of protein but soyaflour contains 50 per cent of protein. Hence it is a lot cheaper, more healthy and economic both for vegetarians and Non vegetarians (Manickam, 1992).

Findings of Young (1992) indicates that the nutritional quality of soya protein is such that it may serve as the sole source of protein intake for human and is comparable with good quality animal protein. Hence snacks can be more tastier and nutritious with just five per cent of soyaflour added to them (Sakthi Soyas).

Incorporation of soyaflour not only improved the nutritional quality but also improved its keeping quality (Jayalakshmi and Neelakantan, 1987).

D) Acceptability of Soya Products

Common soya foods are soya milk, tofu (soyabean protein curd), soya sauce, soya yoghurt, soya Candy, soya oil and soya Ice cream (Pushpendra, 1992). The other products are Miso (Fermented soya bean paste), Natto (Fermented whole soya beans), Tempeh (Fermented and deep fat fried whole soya beans), Sufu (Fermented soya bean Protein curd) and Kinako (Roasted soya bean flour) (Fukushima, 1991). The four main products produced by processing soya bean are full fat soyaflour, defatted soya bean flour, soya protein concentrate and soya protein isolate. A number of soya foods such as flours, soya oil, protein concentrates and isolates, various other fermented and coagulated products are available in the world market (Gandhi and Ali, 1987). Increasing consumption of traditional soya foods

(Tofu and Soya Milk) and second generation soya foods is highlighted (Messina and Messina, 1991).

Soya milk has been quite acceptable in the oriental world where it is used as a substitute for cow's milk and also as a beverage (Minkeni and Nyaruhucha, 1994). 100 grams of soya milk contains 50 per cent of more protein than cow's milk and 214 per cent more than breast milk.

Soyaflour can be incorporated into the Indian diet. Soya flour with its high lysine content increases the protein content of bakery products and improves aminoacid balance, increases water absorption, decreases mixing time and reduces fermentation. It also results in less fat consumption, emulsification, structure building, textural improvements, crumb tenderness, crumb whiteness and extension of shelf life. Soyaflour supplementation enriches functional and nutritional properties of baked products like bread, cake, biscuit and doughnuts (Sinha, 1992).

Soya fortification at 12 per cent produced acceptable and nutritionally improved bread (Ponte et al., 1992). Acceptability of black gram pappad incorporated with soyaflour upto 70 per cent decreased with increase in percentage of soyaflour added.

Soyaflour can replace 20-40 per cent of egg solids added to many bakery products. Flavour was acceptable at even higher levels of soyaflour added (Duxbury, 1987).

The product prepared from soyaflour, soya slurry and Potato paste blended in the proportion of 17:33:50 was very well accepted as deep fat fried snack (Singh and Nath, 1990).

An organoleptic evaluation of soya bean flour at upto 20 per cent in wheat rotis showed no adverse effect. Protein, ash, calcium, phosphorus and phytic acid contents were increased (Ahmad et al., 1987).

When defatted soyaflour was incorporated upto 20 per cent level in Turkish style frank furters, there was no significant difference in physical and sensory properties between the control group and the treatment groups and was found to be acceptable (Yetim et al., 1992).

Substitution of defatted soyaflour for chick pea flour and wheat flour in three snacks ie., Murukku, Nankhatai and Mysorepak were evaluated. Consumer acceptance tests returned 82.8 per cent positive results and indicate that the snacks were well liked (Sharma et al., 1993).

One of the most popular soyabean product is Tofu. It is made from soya milk and contains 6 to 8.4 per cent protein (Ashenafi, 1994). The supplementation food for infants called "Poshak" prepared from Bengal gram, roasted wheat and blanched soya beans is comparable to commercial supplementary foods like Cerelac and Farex and is higher in fat content (7.8 per cent) than Farex (7.5 per cent) and protein content is higher (19 per cent) (Joshi et al., 1991).

As a component of oriental dishes, soya sauce is essential as a flavour enhancer in the cuisine of many nations. It can add a lift to quite ordinary preparations (Food Manufacture, 1991).

Its use is wide spread all over the world. In Hongkong, people drink more soya beverage than coke and Americans are eating soya each time they bite into a burger. Soyaflour is added to wheat flour for bread in Sri Lanka, to make bread more wholesome (The Hindu, 1987).

Soyabean is a wonder crop of multiple uses (Indian Farmers Digest, 1992).

Soya foods use in fast foods and nutritious soft drinks is fast catching up (Kataria, 1991). Use of soya bean as snack food of the type exemplified by roasted peanuts was

explored by roasting hydrated beans, hull removal and splitting. The product has a crunchy texture, mild nutty flavour and was devoid of urease activity (Das, 1992).

Soya foods are not excellent sources of calcium because of their fibre and phytate constituents which may bind minerals (JADA, 1988). The anti-nutritional factors such as goitrogens, trypsin inhibitors, anti-vitamin B_{12}, D and E are destroyed by processing soya bean. Products with suitable nutritional properties can be obtained after the elimination of anti-nutritional factors (Padgaonkar, 1991).

A new use of full fat soyaflour consists of blending it with cheese whey and spray drying the mixture to produce a powder of good nutritive value suitable for a variety of food uses. Soya flours are used as emulsifiers in ground meat products, baked foods and soups. In cakes, soyaflour help to minimise shrinkage.

Soyabean has favourable features such as the absence of animal fat, low caloric value and the presence of indigestible polysaccharides, ie., roughage which may make them nutritionally desirable. Much of the soya bean oil is used for the manufacture of margarine.

It has been reported that the dietary fibre has a lubricating action on the faeces and reduces the

constipation. Also fibre being a poor source of phytic acid dilutes the phytic acid concentration of food and thus helps in better absorption of minerals like iron, calcium, magnesium and zinc which are vital for the body (Khare et al., 1993).

Methodology

III. METHODOLOGY

The method involved in the study "Incorporation of Defatted Soyaflour in Snacks Sold in Three Theatre Canteens" was carried out under the following headings:

A) Identification of Theatre Canteens

B) Selection, Standardisation and Sensory Evaluation of Soya Incorporated Recipes

C) Acceptability of Recipes by the Clientele.

A) Identification of Theatre Canteens

The investigator selected three theatre canteens in Tirupur based on accessibility, a full-fledged canteen that has a high clientele turnover, co-operation extended by the management and canteen workers. The three selected theatres were "Gajalakshmi, Ramlakshman and Universal".

Both theatre canteens and clientele were selected by convenience sampling method also called as chunk method. This method is referred as the selection by convenience (Gupta, 1994). Fifty clienteles from each theatre canteen was selected including the employees of theatres with varied age group.

B) Selection, Standardisation and Sensory Evaluation of Soya Incorporated Recipes

Consumer interest in food, nutrition and health is growing. Traditional recipes can often be sensibly modified to meet good nutrition principles with changes to the ingredients or method of preparation or both. Hence traditional recipes like bajji prepared with bengal gram flour, rice flour, chilli powder, salt and plantain and bonda prepared with bengal gram flour, rice flour, onion, chillies and salt with additions such as spices and sodium bicarbonate to impart crisp and crunchy texture to the fried product as Dhawan and Singh (1991) had explained were selected for the purpose of incorporating protein rich soya. These two deep fat fried items are the most favoured snacks in any food service institution. Hence defatted soyaflour was incorporated in the recipes in three different percentages as ten, fifteen and twenty percent levels. Nutritive value of the recipes with different percentages of soyaflour was calculated.

TABLE I

NUTRITIVE VALUE OF BAJJI

Nutrients	Percentage of soyaflour added		
	10	15	20
Energy (Kcal)	355	355	354
Carbohydrate (g)	63.0	61.8	60.6
Protein (g)	17.2	18.6	19.9
Fat (g)	3.8	3.7	3.5

TABLE II

NUTRITIVE VALUE OF BONDA

Nutrients	Percentage of soyaflour added		
	10	15	20
Energy (Kcal)	355	355	354
Carbohydrate (g)	63.0	61.8	60.6
Protein (g)	17.2	18.6	19.9
Fat (g)	3.8	3.7	3.5

The two selected recipes were standardised using trial and error method. Recipes that are tested for quantity, quality, procedures, time, temperature, equipment and yield are called standardised recipes (Khan, 1987). The trial and

error method is applicable to relatively simple recipes in which the ingredients are limited in number. Based on suitability, the original recipe is multiplied, normally twice the size of the original recipe. The yield and other characteristics are evaluated. If the quantity and quality are acceptable, then the recipe is further multiplied. This process is continued till desired quantity and quality are achieved. The investigator repeated the recipes thrice in order to get consistent results with different percentage incorporation of soyaflour.

Watts et al. (1989) is of the view that acceptance tests are done to determine the degree of consumer acceptance for the product. An acceptability test was conducted using panel members. According to Piggot (1984), the panel is the group of assessors chosen to participate in a sensory test. A taste panel consisting of 15 members including 8 post graduate students and 7 teachers who were semi-trained were chosen to do the sensory evaluation of the standardised recipes.

A panel evaluation was conducted to assess the appearance, colour, texture, flavour and taste of the recipes. Score cards with three point scale were used to evaluate the recipes (Appendix I). Score cards are used to find out the acceptability of a product or to evaluate a

product with regard to all its attributes like colour, taste, texture, flavour and so on. Score card is the most elaborate form of rating instrument often called a numerical rating scale. The views of the consumers regarding the product are assessed through this score card (Sidhu, 1987).

C) Acceptability of Recipes by the Clientele

Since there was no significant difference in the acceptability of the two selected recipes with ten, fifteen and twenty per cent soyaflour by the panel members, the three levels of incorporation was followed in the recipes sold in the three theatre canteens also. Each recipe with different percentage incorporation of soyaflour was repeated for three consecutive days in all the three theatre canteens. Score cards were issued to 50 interested subjects in each theatre canteen (Appendix II). The mean acceptability scores were computed from the scores obtained.

Results and Discussion

IV. RESULTS AND DISCUSSION

The data obtained in the present study entitled "Incorporation of Defatted Soyaflour in Snacks Sold in Three Theatre Canteens" have been analysed and discussed under the following headings:

A) Nutritive Value of Selected Recipes

B) Mean Acceptability Scores of Selected Recipes

i) Panel evaluation

ii) Clientele evaluation

A) Nutritive Value of Selected Recipes

TABLE III

NUTRIENT COMPOSITION OF BAJJI

Nutrients	Percentage of soya flour added			
	Standard	10	15	20
Energy (Kcal)	356	355	355	354
Carbohydrate (g)	65.3	63.0	61.8	60.6
Protein (g)	14.5	17.2	18.6	19.9
Fat (g)	4.1	3.8	3.7	3.5

From the Table III given above, it was revealed that protein content had increased considerably from 14.5 g of standard to 19.9 g at 20 per cent level of soya incorporation. Carbohydrate and fat contents of the product

was reduced considerably by increasing the percentage of soyaflour incorporation. Energy was found to decrease by increasing the percentage of soyaflour incorporation but was negligible. Panichapakdi (1990) has stated that soyabean components can be used as an ingredient in health food.

TABLE IV

NUTRIENT COMPOSITION OF BONDA

Nutrients	Percentage of soyaflour added			
	Standard	10	15	20
Energy (Kcal)	356	355	355	354
Carbohydrate (g)	65.3	63.0	61.8	60.6
Protein (g)	14.5	17.2	18.6	19.9
Fat (g)	4.1	3.8	3.7	3.5

The above Table IV revealed that protein content had increased from 14.5 g of standard to 19.9 g at 20 per cent level of soya incorporation. Carbohydrates and fat contents was reduced considerably by increasing the percentage of soya. Ahmad et al. (1987) has pointed out that carbohydrate content significantly decreased with the added soyabean flour and protein value was increased.

B) Mean Acceptability Scores of Selected Recipes

i) Panel evaluation

TABLE V

MEANS SCORES OBTAINED FOR BAJJI

(N=15)

Quality attributes	Percentage of soya flour added			
	Standard	10	15	20
Appearance	2.2	2.2	2.0	1.7
Colour	2.8	2.6	2.1	2.7
Texture	2.7	2.3	2.1	2.5
Flavour	2.1	1.9	1.7	2.0
Taste	1.9	1.9	1.7	2.0
Overall	2.5	2.3	2.0	2.4

Soyaflour was incorporated in three different percentages as 10, 15 and 20 per cent levels in bajji and compared the scores with the standard as shown in Plate 1. The data obtained from the above Table V indicates that the standard was highly acceptable. Bajji with 10 per cent and 20 per cent soya flour were found to be acceptable as the standard but bajji with 15 per cent soya flour was least acceptable as the texture of the product was found to be hard when compared to the standard.

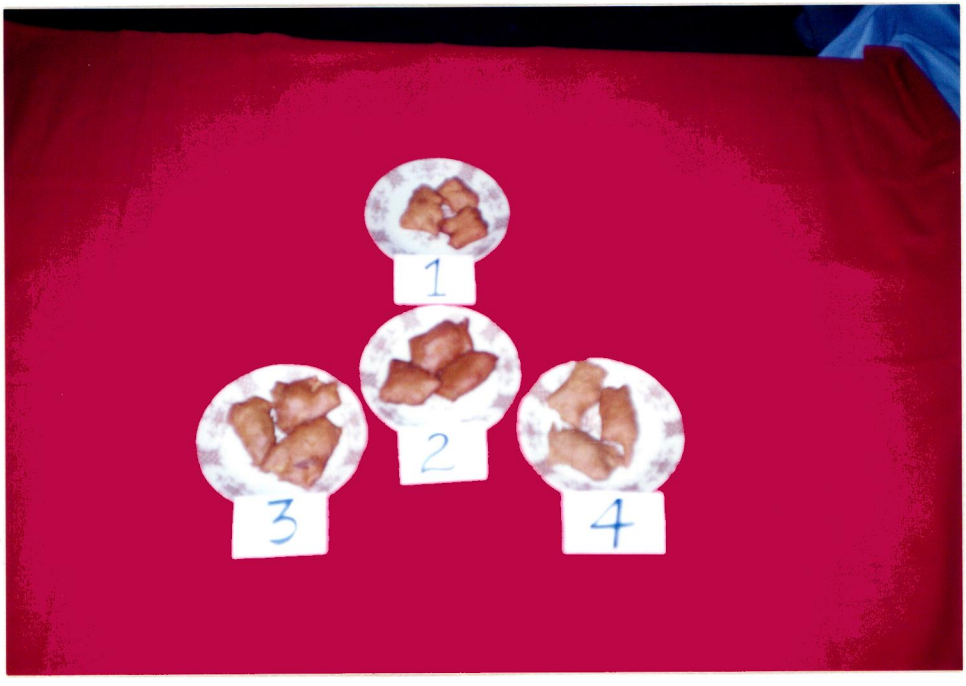


Plate 1.

SOYA INCORPORATED BAJJI

1. Standard
2. 10 per cent soya incorporated
3. 15 per cent soya incorporated
4. 20 per cent soya incorporated

Thus there was no significant difference in the organoleptic evaluation of the product when soya flour was incorporated upto twenty per cent level. This was proved by the study conducted by Deepa et al. (1992) on the incorporation of soyaflour upto 40 per cent for making papads which was found to be acceptable. The acceptability score was similar to the standard upto 40 per cent of soyaflour and decreased with the increase in the level of soyaflour incorporated in the product.

TABLE VI

MEAN SCORES OBTAINED FOR BONDA

(N=15)

Quality attributes	Percentage of soya flour added			
	Standard	10	15	20
Appearance	1.9	1.9	1.9	1.9
Colour	2.8	2.8	2.5	2.8
Texture	2.3	2.1	2.1	2.2
Flavour	2.0	1.9	1.9	1.9
Taste	2.0	2.0	1.4	1.9
Overall	2.3	2.3	1.9	2.2

The same level of incorporation of soya as that of bajji was done for bonda (Plate 2). Sensory evaluation of the product was done and the overall acceptability of the

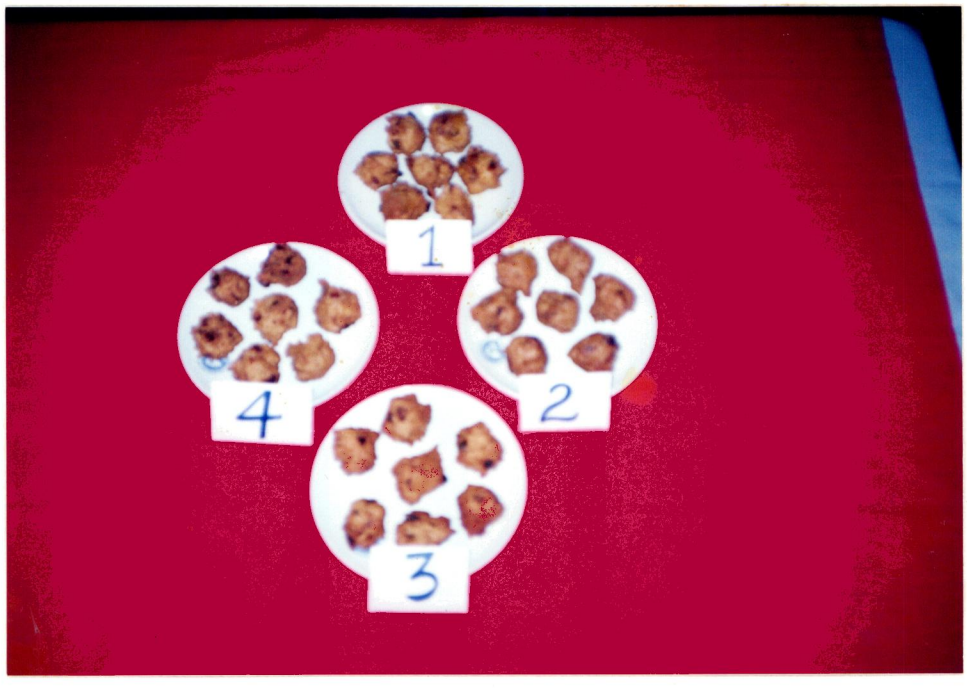


Plate 2.

SOYA INCORPORATED BONDA

1. Standard
2. 10 per cent soya incorporated
3. 15 per cent soya incorporate
4. 20 per cent soya incorporate

product was arrived at. Standard and ten per cent soyaflour incorporated product were found to be highly acceptable. As 15 per cent soyaflour incorporated product was hard in texture and slightly burnt compared to the standard, it was not found to be highly acceptable. Bonda with 20 per cent soyaflour was as acceptable as that of the standard.

ii) Clientele Evaluation

From the below Table VII, soya incorporated in three different percentages as ten per cent, 15 per cent and 20 per cent were considered as Group I, Group 2 and Group 3. The acceptability of the product was compared with different percentages of soyaflour incorporation and also with the three theatre canteens. The overall scores of the product at three different percentages of soyaflour incorporation revealed that there was no significant difference in the organoleptic evaluation. The texture of the product at 15 per cent and 20 per cent were found to be hard which supports the study of (Thandon et al., 1987) revealing that rehydration became poor because of soy fortification rendering the product hard in texture. The product was also evaluated statistically based on F-ratio. The statistical analysis done for the different percentages of soyaflour incorporation revealed that the appearance, colour, texture flavour and taste were not significant and overall was found

TABLE VII

MEAN SCORES OBTAINED FOR BAJJI FROM THE CLIENTELE OF THREE THEATRE CANTEENS

(N=150)

Quality attributes	Percentage of soya added									F-Ratio	
	10			15			20			Groups	Theatre Canteens
	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3		
Appearance	2.0	2.0	2.3	2.0	2.2	2.2	1.8	1.9	2.0	2.6875	1.3051
Colour	2.0	2.3	2.2	2.3	2.1	2.1	2.1	2.2	1.9	0.5000	0.7129
Texture	2.5	2.7	2.5	2.8	2.3	2.4	2.3	2.2	2.3	2.5769	0.3702
Flavour	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	1.9	4.0000	0.5200
Taste	2.0	2.0	1.7	2.1	2.3	2.1	2.1	2.1	1.8	2.2273	2.4808
Overall	2.1	2.2	2.1	2.2	2.2	2.2	2.0	2.1	2.0	9.5000*	0.5600

T_1 - Theatre canteen one
T_2 - Theatre canteen two
T_3 - Theatre canteen three

* Signficantly different at 5 per cent level

to be significant at five per cent level. When the three theatre canteens were compared by statistical analysis, it was found that the F-ratio for all the attributes like appearance, colour, texture, flavour, taste and overall were found to be not significant either at five per cent level or one per cent level. Thus the product was found to be acceptable upto 20 per cent of soyaflour incorporation. This fact was supported by the study conducted by Kumari et al. (1992) who stated that pakora prepared from blend containing 40 per cent defatted soyaflour were organoleptically acceptable and did not differ significantly upto 30 per cent level of defatted soyaflour addition. The acceptability scores obtained for bajji in three theatre canteens were represented in Figures 1, 2 and 3.

Fig. 1. Acceptability scores obtained for bajji in theatre canteen one (T_1)

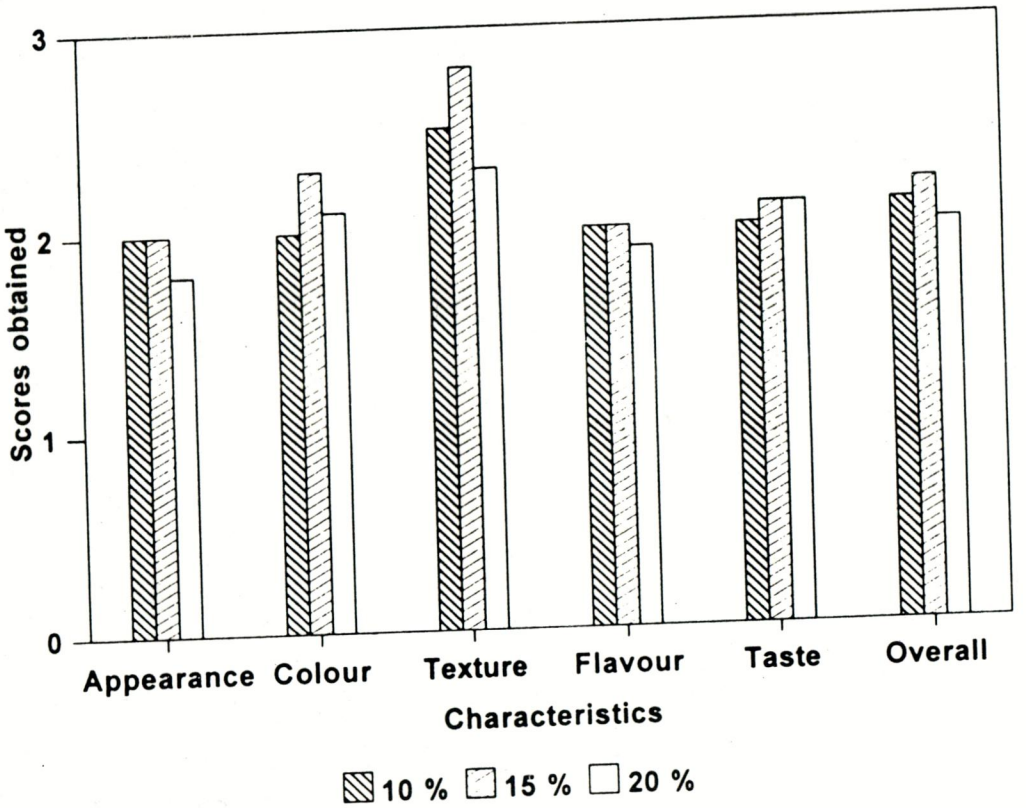


Fig. 2. Acceptability scores obtained for bajji in theatre canteen two (T_2)

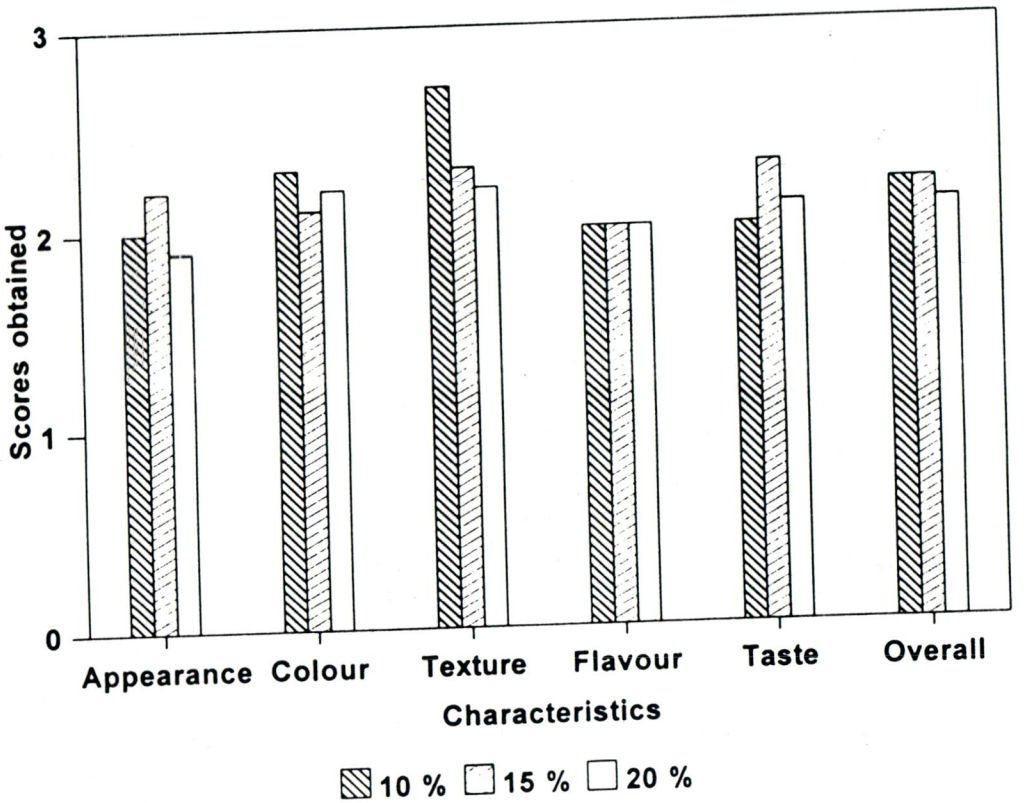


Fig. 3. Acceptability scores obtained for bajji in theatre canteen three (T_3)

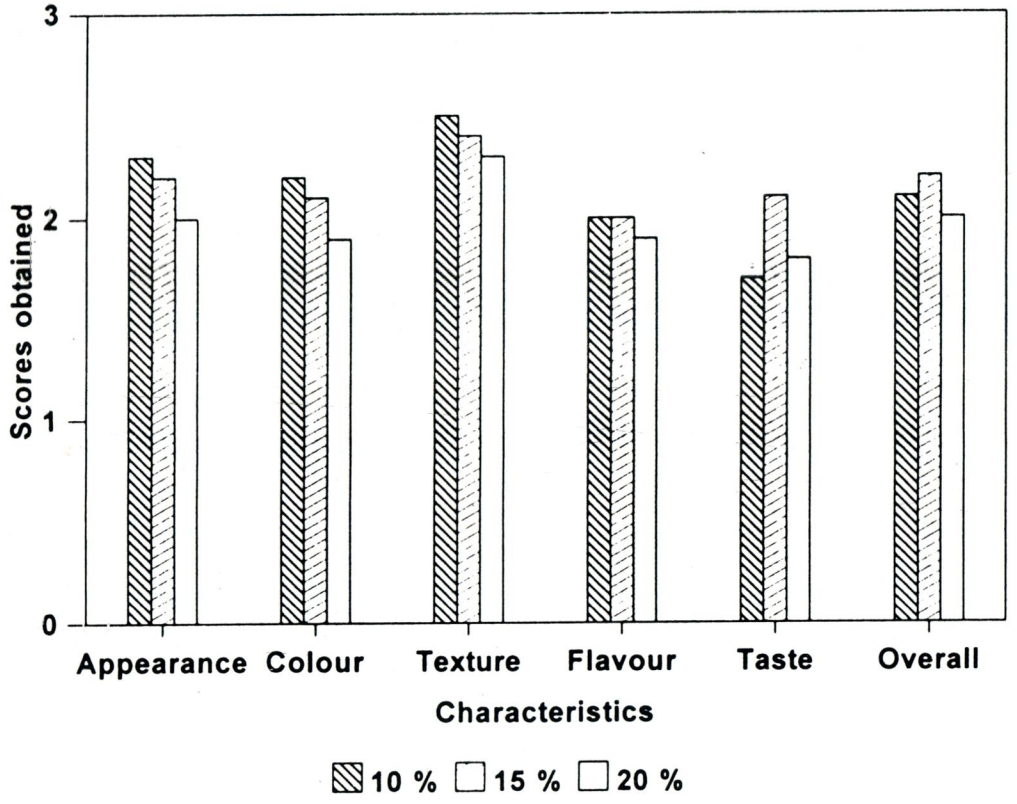


TABLE VIII

MEAN SCORES OBTAINED FOR BONDA FROM THE CLIENTELE OF THREE THEATRE CANTEENS

(N=150)

Quality attributes	Percentage of soya added									F-Ratio	
	10			15			20			Groups	Theatre Canteens
	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3		
Appearance	1.8	2.1	2.1	1.9	1.9	2.1	1.9	2.1	1.8	0.1500	1.5086
Colour	2.2	2.3	2.2	2.2	2.1	2.0	2.2	2.2	2.2	3.2500	0.5774
Texture	2.3	2.4	2.3	2.3	2.3	2.3	2.2	2.2	2.2	13.0000**	0.1342
Flavour	1.9	2.0	2.1	1.8	2.0	2.1	1.7	1.9	1.7	3.0714	1.2399
Taste	2.1	2.1	2.1	2.1	1.9	2.1	1.9	2.0	2.0	2.4000	0.3675
Overal	2.1	2.2	2.2	2.1	2.0	2.1	2.0	2.1	2.0	9.5000*	0.1223

T_1 - Theatre canteen one
T_2 - Theatre canteen two
T_3 - Theatre canteen three

* Signficantly different at 5 per cent level
** Signficantly different at 1 per cent level

The overall scores of the product in three different percentages of soyaflour incorporation were found to be similar with no significant difference in the sensory evaluation. When the scores of different percentages of soyaflour incorporation were analysed statistically, F-ratio indicates that texture was significant at one per cent level. The overall ratio was significant at five per cent level. But appearance, colour, flavour and taste were not significant relating to the study of Rathod and Williams (1973) according to which consumers accepted Chappaties containing 20 per cent soyabean flour without appreciable adverse reaction. The acceptability scores obtained for bonda in three theatre canteens were represented in Figures 4, 5 and 6.

When the three theatre canteens were compared statistically, it was found that there was no difference in the sensory attributes of the products.

Fig. 4. Acceptability scores obtained for bonda in theatre canteen one (T_1)

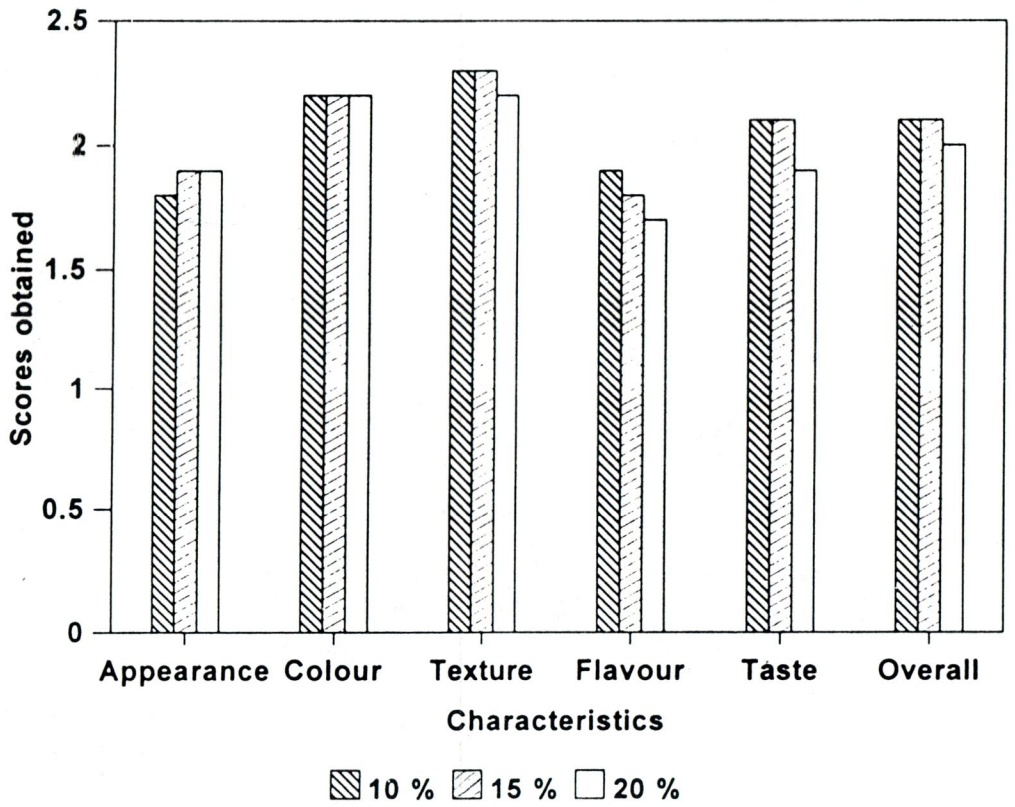


Fig. 5. Acceptability scores obtained for bonda in theatre canteen two (T_2)

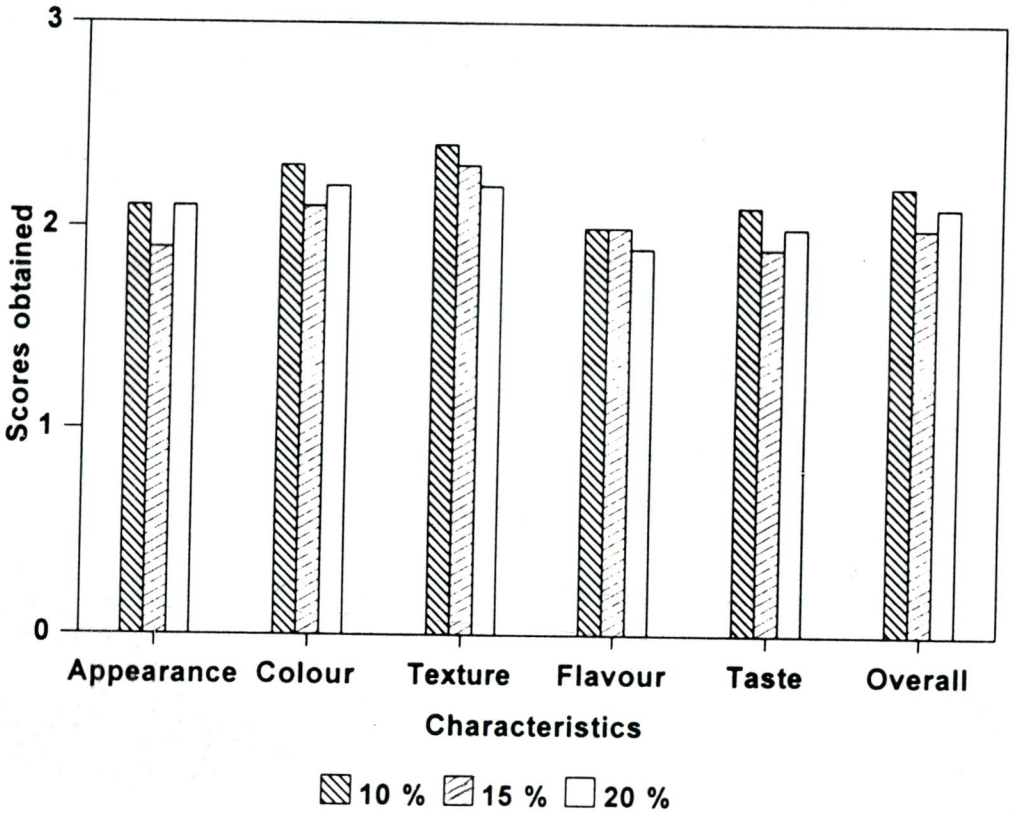
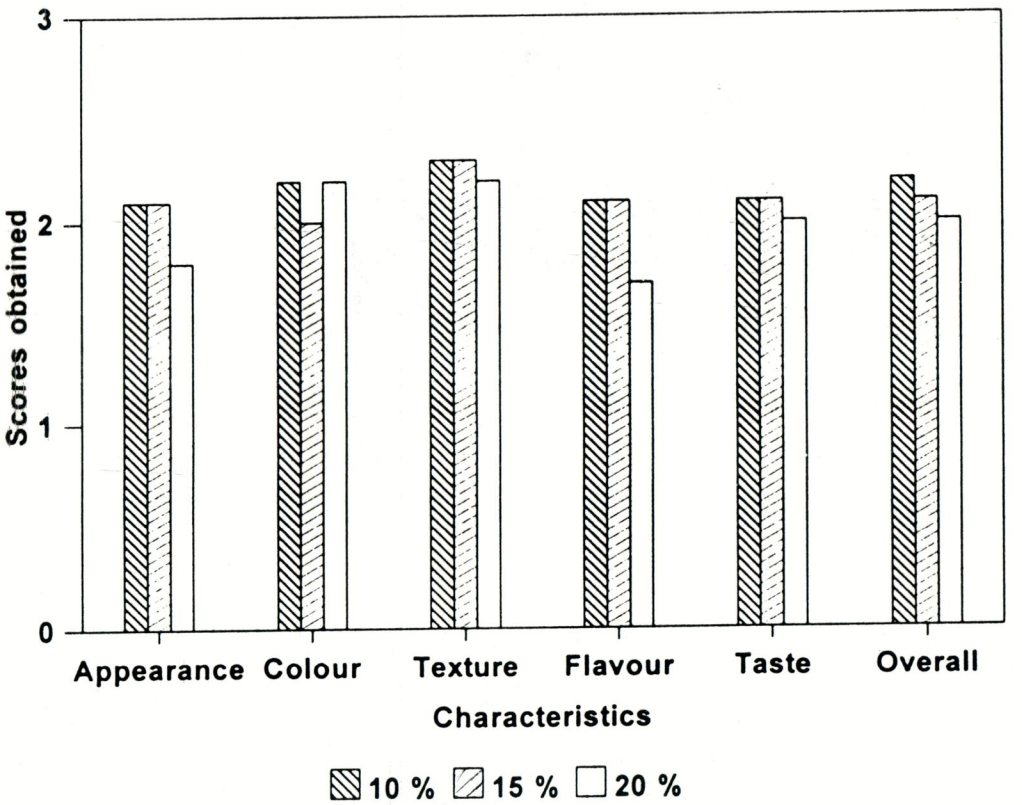


Fig. 6. Acceptability scores obtained for bonda in theatre canteen three (T_3)



Summary and Conclusion

V. SUMMARY AND CONCLUSION

A study was conducted to elicit information regarding "Incorporation of Defatted Soya Flour in Snacks Sold in Three Theatre Canteens". As clientele turnover was high in theatres in Tirupur, three theatre canteens were selected to conduct the study.

Soyaflour was incorporated in popular snack items like bajji and bonda in three theatre canteens so as to increase the protein content.

Panel evaluation was conducted with panel members by incorporating soya flour in bajji and bonda in three different percentages - 10, 15 and 20. Score cards with 3 hedonic scale were used to find out the acceptability of the products. It was found to be highly acceptable with no significant difference in the sensory evaluation of the products with ten, fifteen and twenty per cent of soya flour incorporation.

Since there was no significant difference in the acceptability of snacks with 10, 15 and 20 per cent soyaflour incorporation by the panel members, soyaflour with the same percentages as 10, 15 and 20 were incorporated in bajji and bonda in the three theatre canteens. Each recipe with different percentage was repeated for three consecutive

days in all the three theatre canteens. Clientele who were found to be co-operative were given score cards and the mean acceptability scores were tabulated. Quality attributes like appearance, colour, texture, flavour and taste including the overall scores were evaluated.

The scores were also analysed statistically and F-ratio indicated that there was no significant difference in the acceptability of bajji and bonda between theatre canteens at five per cent and one per cent level. The overall ratio between the different percentages of soyaflour was found to be significant at five per cent level.

Thus the results of the study indicates that the snacks were highly acceptable upto 20 per cent incorporation of soyaflour.

Recommendations

As soya was found to be easily acceptable upto 20 per cent, it can be incorporated in the snacks that are sold in theatre canteens in order to improve the nutrient content of the snacks which will help in improving the nutritional status of population to the extent possible. Similar studies can be undertaken in commercial, non-commercial and fast food outlets also.

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Appendices

APPENDIX - I

SCORE CARD FOR PANEL MEMBERS

Name of the Recipe:

S.NO.	Characteristics	1	2	3	4
1.	**Appearance**				
	Excellent				
	Good				
	Fair				
2.	**Colour**				
	Golden Brown				
	Brown				
	Burnt				
3.	**Texture**				
	Soft				
	Soggy				
	Hard				
4.	**Flavour**				
	Excellent				
	Good				
	Fair				
5.	**Taste**				
	Excellent				
	Good				
	Fair				

APPENDIX II

SCORE CARD FOR CLIENTELE

நெ.	தன்மைகள்
1.	தோற்றம்
	மிகநன்று
	நன்று
	சுமார்
2.	நிறம்
	பொன்னிறம்
	பிரவுன்
	தீய்ந்தது
3.	தன்மை
	மிருதுவானது
	எண்ணெய் ஊறியது
	கடினமானது
4.	வாசனை
	மிகநன்று
	நன்று
	சுமார்
5.	சுவை
	மிகநன்று
	நன்று
	சுமார்

APPENDIX - III

RECIPES AND METHOD OF PREPARATION OF THE SELECTED RECIPES

Bajji

Ingredients	Percentage of soya added			
	STANDARD	10	15	20
Bengal gram flour	75g	67.5g	63.75g	60g
Rice flour	25g	25g	25g	25g
Plantain (green)	50g	50g	50g	50g
Chilli Powder	5g	5g	5g	5g
Omum seeds	2.5g	2.5g	2.5g	2.5g
Cooking Soda	1pinch	1pinch	1pinch	1pinch
Salt	2.5g	2.5g	2.5g	2.5g
Soyaflour	-	7.5g	11.25g	15g
Oil	50g	50g	50g	50g

Method

1) Bengal gram flour, rice flour, chilli powder, soyaflour, cooking soda, powdered omum seeds and salt were mixed together.

2) Water was added to make batter.

3) Plantain was sliced lengthwise.

4) The sliced plantain was dipped in the batter and deep fat fried in the oil to golden brown.

Bonda

Ingredients	Percentage of soya added			
	STANDARD	10	15	20
Bengal gram flour	75g	67.5g	63.75g	60g
Rice flour	25g	25g	25g	25g
Chillies (Green)	10g	10g	10g	10g
Omum seeds	2.5g	2.5g	2.5g	2.5g
Cooking soda	1pinch	1pinch	1pinch	1pinch
Salt	2.5g	2.5g	2.5g	2.5g
Onion (small)	30g	30g	30g	30g
Soyaflour	-	7.5g	11.25g	15g
Oil	50g	50g	50g	50g

Method

1) Onions and chillies were finely chopped.

2) Bengal gram flour, rice flour, soyaflour, cooking soda, powdered omum seeds and salt were mixed together and made into batter of thick consistency by adding little amount of water.

3) The chopped onions and chillies were mixed with the batter.

4) It was made into balls and deep fat fried in the oil to golden brown.

APPENDIX IV

NUTRIENT COMPOSITION OF BAJJI WITHOUT THE INCORPORATION OF DEFATTED SOYAFLOUR

Name of the item	Quantity (g)	Energy (Kcal)	Carbohydrate (g)	Protein (g)	Fat (g)
Bengal gram flour	75	270	45.7	12.8	4.0
Rice flour	25	86	19.6	1.7	0.1
	TOTAL	356	65.3	14.5	4.1

APPENDIX V

NUTRIENT COMPOSITION OF BONDA WITHOUT THE INCORPORATION OF DEFATTED SOYAFLOUR

Name of food item	Quantity (g)	Energy (kcal)	Carbohydrate (g)	Protein (g)	Fat (g)
Bengal gram flour	75	270	45.7	12.8	4.0
Rice flour	25	86	19.6	1.7	0.1
	TOTAL	356	65.3	14.5	4.1

APPENDIX VI

NUTRIENT COMPOSITION OF SELECTED RECIPES WITH INCORPORATION OF 10 PER CENT DEFATTED SOYAFLOUR

Name of food item	Quantity (g)	Energy (Kcal)	Carbohydrate (g)	Protein (g)	Fat (g)
BAJJI					
Bengal gram flour	67.5	243	41.1	11.5	3.6
Rice flour	25	86	19.6	1.7	0.1
Soyaflour	7.5	26	2.3	4.0	0.1
BONDA					
Bengal gram flour	67.5	243	41.1	11.5	3.6
Rice flour	25	86	19.6	1.7	0.1
Soyaflour	7.5	26	2.3	4.0	0.1

APPENDIX VII

NUTRIENT COMPOSITION OF SELECTED RECIPES WITH INCORPORATION OF 15 PER CENT DEFATTED SOYAFLOUR

Name of food item	Quantity (g)	Energy (Kcal)	Carbohydrate (g)	Protein (g)	Fat (g)
BAJJI					
Bengal gram flour	63.75	230	38.8	10.9	3.4
Rice flour	25	86	19.6	1.7	0.1
Soyaflour	11.25	39	3.4	6.0	0.2
BONDA					
Bengal gram flour	63.75	230	38.8	10.9	3.4
Rice flour	25	86	19.6	1.7	0.1
Soyaflour	11.25	39	3.4	6.0	0.2

APPENDIX VIII

NUTRIENT COMPOSITION OF SELECTED RECIPES WITH INCORPORATION OF 20 PER CENT DEFATTED SOYAFLOUR

Name of food item	Quantity (g)	Energy (Kcal)	Carbohydrate (g)	Protein (g)	Fat (g)
BAJJI					
Bengal gram flour	60	216	36.5	10.3	3.2
Rice flour	25	86	19.6	1.7	0.1
Soyaflour	15	52	4.5	7.9	0.2
BONDA					
Bengal gram flour	60	216	36.5	10.3	3.2
Rice flour	25	86	19.6	1.7	0.1
Soyaflour	15	52	4.5	7.9	0.2