

Incorporation Of Soya In Selected Recipes In Two Industrial Canteens And Their Acceptability

By

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A THESIS SUBMITTED TO
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MASTER OF SCIENCE IN FOOD SERVICE MANAGEMENT AND DIETETICS

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CANTEENS AND THEIR ACCEPTABILITY

By

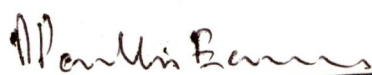
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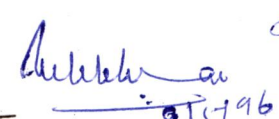
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Certified as Bonafide Research Work


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Head of the
Department


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Dean of the
Faculty


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Guide

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Contents

CONTENTS

| Chapter No. | Title | Page No. |
|-------------|--|----------|
| | LIST OF TABLES | |
| | LIST OF FIGURES | |
| | LIST OF PLATES | |
| | LIST OF APPENDICES | |
| I | INTRODUCTION | 1 |
| II | REVIEW OF LITERATURE | 4 |
| | A. Impact of diet on work efficiency | 4 |
| | B. The Golden Nugget of Nutrition | 5 |
| | C. Incorporation of protein rich defatted soya flour in traditional recipes | 7 |
| | D. Soya products and their acceptability | 7 |
| | E. The role of soya in preventing and treating chronic disease | 12 |
| III | METHODOLOGY | 15 |
| | A. Identification of industrial canteens | 15 |
| | B. Selection, standardisation, nutrient content and sensory evaluation of soya incorporated recipes | 15 |
| | C. Acceptability of recipes by the industrial workers | 17 |
| IV | RESULTS AND DISCUSSION | 19 |
| | A. Selection, standardisation, nutrient content and sensory evaluation of traditional recipes | 19 |

| | | |
|---|---|----|
| | i. Selection and standardisation of selected recipes | 19 |
| | ii. Nutrient content of selected recipes | 20 |
| | iii. Panel evaluation of selected recipes | 24 |
| | B. Acceptability of selected recipes by the industrial workers | 30 |
| V | SUMMARY AND CONCLUSION | 35 |
| | BIBLIOGRAPHY | |
| | APPENDICES | |

LIST OF TABLES

| Tables No. | Title | Page No. |
|------------|--|----------|
| I | Nutrient content of vadai | 20 |
| II | Nutrient content of sambar | 21 |
| III | Nutrient content of kootu | 22 |
| IV | Nutrient content of iddli | 22 |
| V | Nutrient content of uthappam | 23 |
| VI | Mean acceptability scores obtained for vadai in industrial canteen I | 24 |
| VII | Mean acceptability scores obtained for vadai in industrial canteen II | 25 |
| VIII | Mean acceptability scores obtained for sambar in industrial canteen I | 26 |
| IX | Mean acceptability scores obtained for sambar in industrial canteen II | 27 |
| X | Mean acceptability scores obtained for kootu in industrial canteen I | 28 |
| XI | Mean acceptability scores obtained for kootu in industrial canteen II | 28 |
| XII | Mean acceptability scores obtained for uthappam in industrial canteen I | 29 |
| XIII | Mean acceptability scores obtained for iddli in industrial canteen II | 30 |
| XIV | Mean acceptability scores obtained from the clientele of two industrial canteens | 31 |

LIST OF FIGURES

| Figure No. | Title | Page No. |
|------------|---|----------|
| I | Acceptability scores obtained for vadai served in Industrial canteen I | 25b |
| II | Acceptability scores obtained for vadai served in Industrial canteen II | 25c |
| III | Acceptability scores obtained for sambar served in Industrial canteen I | 26a |
| IV | Acceptability scores obtained for sambar served in Industrial canteen II | 26b |
| V | Acceptability scores obtained for kootu served in Industrial canteen I | 28a |
| VI | Acceptability scores obtained for kootu served in Industrial-canteen II | 28b |
| VII | Acceptability scores obtained for uthappam served in Industrial canteen I | 29a |
| VIII | Acceptability scores obtained for iddli served in Industrial canteen II | 30a |
| IX | Acceptability scores obtained for (Vadai, Sambar and Kootu) served in Industrial canteen I and II | 32a |

LIST OF PLATES

| Plate No. | Title | Page No. |
|-----------|--|----------|
| I | Evaluation of soya incorporated recipes by panel members | 23a |
| II | Vadai | 24a |
| III | Sambar | 25a |
| IV | Kootu | 27a |
| V | Full meals with soya incorporated recipes (vadai, sambar and kootu) with 10 per cent incorporation of soya for clientele evaluation. | 31a |

LIST OF APPENDICES

| Appendix No. | Title |
|--------------|---|
| I | Standardisation of Selected Recipes A) Vadai B) Sambar C) Kootu D) Uthappam E) Iddli |
| II | Composition of Vadai |
| III | Composition of Sambar |
| IV | Composition of Kootu |
| V | Composition of Uthappam |
| VI | Composition of Iddli |
| VII | Score Card for panel Evaluation |
| VIII | Score card for clientele Evaluation a) Kootu/Sambar b) Vadai |
| IX | Acceptability scores obtained for vadai by the panel members in industrial canteen I |
| X | Acceptability scores obtained for vadai by the panel members in industrial canteen II |
| XI | Acceptability scores obtained for sambar by the panel members in industrial canteen I |
| XII | Acceptability scores obtained for sambar by the panel members in industrial canteen II |
| XIII | Acceptability scores obtained for kootu by the panel members in industrial canteen I |
| XIV | Acceptability scores obtained for kootu by the panel members in |

industrial canteen II

- XV Acceptability scores obtained for uthappam by the panel members in industrial canteen I
- XVI Acceptability scores obtained for iddli by the panel members in industrial canteen II
- XVII Statistical evaluation of data

Introduction

INTRODUCTION

The importance of Industrial food service as it is known today has had an exciting yet slow-developing history. Provision of food for employees has been a necessity since those early days when labour was either forced or hired to work in the fields or on the monuments of antiquity such as the pyramids.

The workers demanded facilities for obtaining a hot meal while at work. Often plants were located away from the centers of cities and towns with no restaurants near and with the keen competition for employees, management realised necessity for providing meal service facilities as an indispensable part of their operations on a concessionaire basis (West et al., 1977).

In 1948 it was made obligatory by law for all the large industrial establishments to provide foods and snacks on subsidiary basis to the workers particularly in big metropolitan cities where communication between the work place and habitation absorbed considerable time and energy (Pasricha, 1986).

Due to economic liberalisation the industrial sectors are on the increase, with more people opting for employment opportunities, and food being the basis for improving production. But the neglected aspect is the

protein quality and quantity which is lacking in the diet of workers since Indian menu is usually a major source of carbohydrate rather than protein. This is supported by the study conducted by Pasricha et al. (1986), who found out that the meals provided in Industrial canteens supplied on an average of 2000 Kilocalories and 48 grams of protein against the recommended level of 2800 Kilocalories and 55 grams of protein (ICMR 1986).

There is significant relationship between calorie and protein intake with the work output. This is supported by Devadas (1988) that "productivity depends on the quality and quantity of the nutrient intake and the resulting nutritional status".

Soyabean is progressively becoming a world wide potential source of major nutrients required for normal diet and the amino acid pattern approaches the optimum recommendation of FAO (Thirumaran et al., 1989).

From a nutritional point of view, soyabeans contains about twice as much protein as red beans, broad beans. It is nutritionally similar to meat, milk and along with rice or wheat , it gives a diet balanced in protein, fat and carbohydrate (Peter and Gupta, 1993).

Defatted soya flour is a common form in which soyabeans can be incorporated in various traditional food preparation which are prepared in industrial canteen to

increase the total calorie content and protein at cheaper rate. This is supported by the study conducted by Gandhi (1992) who found out that the soya incorporated biscuits contains fifty percentage more protein than ordinary biscuit.

Defatted soya flour have a immense value in Indian context and can be easily blended with cereal pulse products to make a variety of traditional dishes like "chappathi", "poori", "pakoda", "vadai" and "dosai" by Manorama and Sarojini (1987) and in Rasogolla by Katara et al. (1990) and in Kulfi by (Rajor and Vani, 1991).

So, the present study aims at incorporation of protein rich defatted soyaflour in major South Indian traditional recipes like sambar, kootu, vadai, which were usually offered by Industrial canteens. The objectives of the present study were

1. To increase the protein content of the foods served in Industrial canteens.
2. To Incorporate defatted soya flour in selected recipes served in selected Industrial canteens.
3. To find out the acceptability of soya incorporated traditional recipes.

Review of Literature

II. REVIEW OF LITERATURE

Literature pertaining to this study "Incorporation of soya in selected recipes in two industrial canteen and their acceptability" is reviewed under the following headings:

- A. Impact of Diet on Work Efficiency
- B. The Golden Nugget of Nutrition
- C. Incorporation of Protein Rich Defatted SoyafLOUR in Traditional Recipes
- D. Soya Products and their Accetability and
- E. The Role of Soya in Preventing and Treating Chronic Disease.

A. Impact of Diet on Work Efficiency

Among the three necessities of life, food is the foremost. Adequate and nutritious food is necessary for good physical and mental development (Wadkar et al., 1988).

The importance of adequate nutrition for maintaining good health and normal physical efficiency among the industrial workers was realised during the second world war by the western countries (Pasricha et al., 1986).

Manual work, light or heavy calls for an additional supply of energy and other materials. A low food intake reduces the physical capacity to work and increases the extent of fatigue, accident, sickness and absence. In order to improve the work efficiency and output

of these workers, adequate diets sufficient not only in calories but also proteins, minerals and vitamins must be available (Bansal and Mehta, 1985).

Diet surveys carried out in India have shown that the diets consumed by Industrial workers are inadequate and lack in protective foods (Swaminathan, 1990).

Presently, the nutrition experts have began 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).

Proteins normally should supply 10-12 per cent of energy. However, in diets of poor population in developing countries, only 9-10 per cent of energy is provided by protein (ICMR, 1993).

B. The Golden Nugget of Nutrition

Soyabeans with their 38-42 per cent of protein and 18-20 per cent of fat content are an excellent and cheap source of calorie and protein (Thandon and Singh, 1987) (Nick 1991).

Soya protein is superior to most other plant proteins and it is fortuitous that soya is rich in lysine, an aminoacid that is in deficit in all the major cereals. This makes it possible to upgrade the protein quality of

diets, predominately based on cereals by inclusion of soya in suitable proportions (Whitaker and Jannerbaum, 1971).

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

Soyabeans appears to be the only answer to solve India's malnutrition problem (Singhal, 1988).

Soya has proved as supplementary food in our daily diet and is considered highly comparable to animal proteins and milk in its nutritive value, as it contains all the essential eight amino acids vital to human diet. Soyabean, therefore is often referred to as a "vegetarian meat" for the non meat eater's. For centuries, the chinese have called soyabeans as "Yellow Jewel", "Great treasure", "Great bean of the land" and the Americans consider soya bean as "cinderella crop" and Indian farmer consider it as "Wonder grain" (Chhabra, 1994).

Soyabeans is the most cost effective crop to combine protein and calorie per unit of resource invested. On the dry basis it produces almost five times more protein than cereals and twice that of other pulses (Panichapakdi, 1994).

C. Incorporation of Protein Rich Defatted SoyafLOUR in Traditional Recipes

In vegetarian society like India, fat and protein of vegetarian origin acquire special significance (Indian Farmers Digest, 1992).

Edible soya flour is the best proteinaceous source in all respects and it can easily replace partially or fully the costly pulse dhals of redgram, blackgram etc. These pulse dhals contain only 18-20 per cent of protein. Hence, it is a lot cheaper, more economic and healthy both for vegetarians and non-vegetarians (Manickam, 1992).

Soya flour contains two times as much protein as dhal 3 times as much as egg and 15 time as much as milk (Sakthi Soyas). Defatted soya flour have a immense value in Indian context and can be easily blended with cereal pulse products to make a variety of traditional dishes (Gandhi et al., 1985). Hence, protein rich soya flour can be incorporated in traditional South Indian dishes.

Snacks can be made more tastier and nutritious with just 5 per cent of Soya flour added to them (Sakthi Soya's 1992).

D. Soya Products and Its Acceptability

Soya beans is a wonder crop of multiple uses (Indian Farmers Digest, 1992). The four main products

produced by processing soya bean are full fat soya flour, defatted soya flour, soya protein concentrate (SPC) and soya protein isolate (SPI) (Lusas and Riaz, 1995).

Common soya foods are soya milk, tofu (Soya bean protein curd) Soya sauce, soya yoghurt, soya candy, soya oil and soya ice cream (Pushpendra, 1992). The other products available are white flakes (defatted soya flakes), grits, temeph (cooked and fermented soya bean held together by the mycelium of *Rhizopus Oligosporus*), miso (fermented soya bean paste) natto (fermented whole soya beans) (Golbitz, 1991). The second generation soya foods have been developed, which includes soya milk cheese, soya burgers (Lusas and Riaz, 1995).

Soya flour can be incorporated into the Indian diets soya flour with its high lysine content increases the protein content of bakery products and improves amino acid balance, increases water absorption, decreases mixing time and reduces fermentation. It also results in less fat consumption, emulsification, structure building, textural improvement, crumb tenderness, crumb whiteness and extension of shelf life (Sinha, 1992).

Tsen and Hoover (1984) have demonstrated that bread with good volume, grain, texture and keeping qualities could be prepared with upto 24 kilo gram soya flour per 100 Kilo grams of wheat flour. Trend now is to replace skim milk

powder in bakery products with cheese whey, soya blends which costs 25 per cent cheaper than milk solids. Soya flour are used in cakes, doughnut mixes, in some varieties of crackers and high protein biscuits.

The second largest use of soya protein is in comminuted and emulsified meat products such as frankfurters, luncheon meats etc. Soya protein find extensive use here because of their moisture binding, fat emulsifying and emulsion stabilising properties (Sulebele, 1994).

As a component of oriental and American cuisiene, soya sauce is essential as a flavour enhancer in many nations (Nunomura and Sasaki, 1986).

Soya milk has been used as a substitute for cow's milk for feeding children and as beverage for adults (Indian Farmers Digest, 1992).

In Hongkong they consume more vitasoy (Soya Beverage) than coke (Aiyar, 1984). In Sri Lanka soya flour is used in combination with wheat or rice flour in many other dishes as a replacement for coconut milk. It is used both in sweet and savoury to improve the taste and nutrition (Food Digest, 1984).

In egypt soya protein was utilised in producing low calorie butter (Ghita and Knir, 1990) and yoghurt like

product from soya milk (Gazzar and Hafez, 1992). In turkey it is incorporated in their traditional dishes trahana and it had comparatively high sensory scores (Lebensmittel, 1993).

Volovik (1988) of ukriain have experimentally prepared "mayonnaise" with partial substitution of extract of soya to improve emulsification.

In India chickpea flour and wheat flour were substituted by defatted soya flour in 3 snacks (Murukku, Nankhatai, and Mysorepak) sensory evaluation of snacks showed that defatted soya flour substituted snacks 25 per cent in murukku (15 per cent) in nankhatai and (100 per cent) in mysorepak were acceptable (Pallavi et al., 1993). Soya flour was incorporated with sorghum flour to prepare methu -Pakkoda, Roti, Upmav, Puttu, Sevai, Laddu and it was found that for the preparation of muthupakkoda soya flour could be incorporated upto (15 per cent) level. Soya flour could be incorporated only upto (30 per cent) for the preparation of Roti, Laddu, Upma, Puttu and Sevai (Jayalakshmi and Neelakantan, 1985).

A study conducted by Rathod and Williams (1973) showed there no significant differences in rating between pure wheat flour and the blend containing (20 per cent) defatted soya flour. Incorporation of (30 per cent) of soya flour in sorghum vermicelli gave product of acceptable

colour, flavour and texture, with improved rehydration capacity (Siwawej, 1990).

Soya milk can be incorporated in 2-3 per cent fat milk upto 20 per cent to produce rasogolla of acceptable quality (Katara et al., 1990). Soya at 20-30 per cent of level in rice based soya cracker was found to be more acceptable (Prince et al., 1994). Soya oil can replace 20 per cent of milkfat, and soya flour can replace 5 per cent of milk solid in the preparation of soya ice cream and this will reduce the cost by upto 13 per cent (Kumar and Narasimhan, 1994).

Incorporation of defatted soya flour upto 6 per cent was found suitable for bread making (Misra et al., 1994). Addition of soya flour (Defatted) to bread increased protein content, decreased carbohydrate content, the calcium and iron content were increased significantly (Dixit et al., 1986).

Puffed soya has snack provided 40 per cent protein (19 per cent) of fat and 420 kilo calories per 100 grams of product. The puffing process reduced beany flavour and bitter taste, in addition to elimination of flatus compound. The crisp and tasty puffed soya founded to be well accepted (Kanchana and Neelakantam, 1995).

The anti nutritional factors such as goitrogens, trypsin-inhibitors, Anti vitamin B₁₂, D and E, all destroyed

by processing soya beans, products with suitable nutritional properties can be obtained after the elimination of anti-nutritional factors (Padgaonkar, 1991).

E. The Role of Soya in Preventing and Treating Chronic Disease

A chinese **materia-medica** text of **AD 450** records that the soya bean was regarded as a specific remedy for the proper functioning of the heart, liver, kidneys, stomach and bowels. It was also used as a remedy for constipation, as a stimulant for the lungs, for the eradication of poison from the system, improving the complexion by cleaning skin of impurities and stimulating the growth and appearance of the hair (Edwardy, 1980).

An ideal food for the prevention and management of malnutrition should be of high nutritive value, acceptable to the children and their mothers, readily available at a cheaper rate, easy to prepare and well tolerated both in health and disease. Soya beans fulfills these conditions (Abiodun, 1991).

Infants with reduced intestinal digestion and absorption capacity as well as in cases of cow's milk intolerance and allergic disease can be fed with soya bean protein formulae (Brand and Hebel, 1986).

In obesity and other metabolic disorder it is convenient to include in the diet, low energy foods rich in fibre with a possibly specific hypolipidemic effect, such as soya dishes (Balabanski, 1985).

Soya protein reduces cholesterol particularly when cholesterol is elevated by dietary means (Kim et al., 1980). Recent studies in our lab have addressed the mechanism of action of soya protein at the molecular level and have indicated that globulin exert a cholesterol lowering effect and that in vitro they can significantly increase the maximal binding of lowdensity lipoprotein to high affinity receptor in liver cells (Lovati et al., 1992).

Soya proteins also may affect atherosclerotic development by increasing the plasma concentration of genistein. Genistein a is flavonoid derived from soya products has been shown to inhibit thrombin formation and plate let activation in vitro in addition to its antigrowth factor activity (Adlercreutz et al., 1993). Soya flour is specially good for diabetic patients because of its low carbohydrate content (Chhabra, 1994).

The recent review of Messina et al. (1994) evaluated the effects of soya products or soya bean components, namely protease, inhibitors isoflavone, inositol hexaphosphate, phytosterols and saponins, inhabits a variety of tumors in various tissues.

Soya bean have played an integral part in Asian culture, both as a food and as a medicine for many centuries. In the west soya beans are best known for their protein content but increasingly, soya foods are being recognized as having potential roles in the prevention and treatment of chronic disease, most notably cancer and heart disease there are also potential roles for soya foods with respect to Osteoporosis and kidney disease.

When one considers the many nutritional attributes of soya foods the very basic (high quality protein, lactose free and cholesterol free and good source of Omega- 3 - fatty acids) to the most exciting (the prevention and or treatment of heart disease and cancer)..It is clear that the community should welcome the incorporation of soya foods into the diets (Carpenter, 1986).

Methodology

III. METHODOLOGY

The method involved in the study "Incorporation of soya in selected recipes in two industrial canteens and their acceptability" was carried out under the following headings:

- A. Identification of Industrial Canteens
- B. Selection, Standardisation, Nutrient value and Sensory Evaluation of Soya Incorporated Recipes and
- C. Acceptability of Recipes by the Industrial Workers

A. Identification of Industrial Canteens

The investigator selected two industrial canteens in Coimbatore based on accessibility, a full fledged canteen that has a high clientele turnover, co-operation extended by the management and canteen workers. The two selected industrial canteens were "Bimetal Bearing Limited Canteen and Cheran Transport Corporation Canteen".

B. Selection, Standardisation, Nutritive value and Evaluation of Soya Incorporated Recipes

There is growing awareness among consumer in the field of food, nutrition and health. Traditional recipes can often be modified to meet nutritional principles by incorporation of nutritious products or change in method of preparation or both. Hence, recipes like sambar, iddli, vadai, kootu from "Bimetal Bearing Limited" canteen and

Sambar, uthappam, vadai, kootu from "Cheran Transport Corporation" canteen were selected for the purpose of incorporating protein rich defatted soya flour.

In general these kootu, sambar, vadai, iddli, and uthappam are the most favoured items preferred by south Indians. Hence defatted soya flour was incorporated at 10,15 and 20 per cent levels in the recipes.

The five selected recipes (sambar, Vadai, Kootu, Uthappam, and Iddli) were standardised using trial and error method. According to Coltman (1987) "A standardised recipe is a formula specifying the quantity and quality of particular food item". In trial and error method, based on suitability. The size of original recipe and the yield are multiplied normally twice. The yield and other characteristics are evaluated. If the quality and quantity are acceptable then the recipe is further multiplied. If not, until desirable quality and quantities are achieved.

The investigator repeated the recipes thrice in order to get consistent results with different per cent incorporation of soya flour. Then the standardised recipes were demonstrated to the cooks working in the selected two industrial canteens.

With the aim of increasing the protein and total energy content of traditional recipes served Industrial canteens and their by increasing the work output, defatted

soya flour was incorporated. Nutritive value of recipes with different per cent of soya incorporation was calculated using the book the nutritive value of Indian Foods (Gopalan et al., 1995).

An acceptability test was conducted using selected panel members. A taste panel consisting of 20 members including 15 industrial workers and 5 administrative officials who were responsible for the canteens evaluated the soya incorporated recipes.

Sensory evaluation has been defined as "A scientific discipline used to evoke, measure, analyse and interpret reactions to those characteristic of food and materials as they are perceived by the senses of sight, smell, taste, touch and hearing" by IFT in America (Cooper, 1993).

The 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 VII).

C. Acceptability of Recipes by the Industrial Workers

Recipes with ten percent incorporation was accepted well except iddli and uthappam. There was slight change in colour and appearance which reduced the overall acceptability of Iddli and uthappam by the panel members in

the two selected canteens. Hence only three recipes (Sambar, Kootu, Vadai) with ten per cent of soya flour incorporation was prepared and presented to the industrial workers. One hundred and fifty industrial workers in each of the two industrial canteens were selected by convenience sampling method also called as chunk method. A chunk refers to the fraction of the population being investigated which is selected neither by probability nor by judgement but by convenience (Gupta, 1994). The recipes with ten per cent incorporation of defatted soya flour were prepared and served to the selected workers for three alternate days. Acceptability of the recipes were assessed by using a three point score card given in Appendix VIII.

Results and Discussion

RESULTS AND DISCUSSION

The data obtained in the present study entitled "Incorporation of Soya in selected recipes in two industrial canteens and their acceptability" is analysed and discussed under the following headings.

A. Selection, standardisation , Nutrient Content and Sensory Evaluation of Traditional recipes.

- i. Selection and Standardisation of Selected Recipes
- ii. Nutrient Content of Selected Recipes
- iii. Panel Evaluation of Selected Recipes

B. Acceptability of selected recipes by industrial workers

A. Selection, Standardisation, Nutrient Content of Recipes and Sensory Evaluation of Traditional Recipes

i. Selection and Standardisation of Selected Recipes

Five traditional recipes (Sambar, Kootu, Vadai, Iddli, Uthappam, were selected for the purpose of incorporating 10 per cent of protein rich defatted soya flour from the routine menu cycle of two selected industrial canteens. Standardisation was done using trial and error method. The standardized recipes were demonstrated to the cooks who are responsible for preparation in the respective Industrial canteens. Purpose of the discussion was to help cook attain accuracy while increasing the total quantity of the recipe.

Nutrient Content of Selected Recipes

Nutritive value of five selective traditional recipes (vadai, sambar, kootu, uthappam and Iddli) was calculated for protein, fat, carbohydrate and energy.

Table I represents the of nutrient content of vadai with different percentage of soya incorporation.

TABLE - I
NUTRIENT CONTENT OF VADAI

| Nutrients | Standard | Percentage of soya added | | |
|---------------------------|----------|--------------------------|-------|-------|
| | | 10 | 15 | 20 |
| Protein (Grams) | 15.33 | 16.48 | 17.06 | 17.63 |
| Fat (Grams) | 16.14 | 17.23 | 17.77 | 18.31 |
| Carbohydrate (Grams) | 43.33 | 41.01 | 39.85 | 38.69 |
| Energy (Kilo Calories) | 364 | 364 | 372 | 374 |

Soya flour was incorporated in three different percentages as 10, 15 and 20 per cent level in vadai served in Industrial canteen I and II. The nutrient content was analysed in order to denote that there was an increase in protein and energy through the incorporation. In case of 20 per cent incorporation as compared to the standard there was 2.3 grams increase in protein and the energy also increased

by 10 kilo calories. The carbohydrate content was reduced by 4.24 grams.

Table II represents the nutrient content of sambar with different percentage of soya incorporation.

TABLE - II
NUTRIENT CONTENT OF SAMBAR

| Nutrients | Standard | Percentage of soya added | | |
|---------------------------|----------|--------------------------|-------|-------|
| | | 10 | 15 | 20 |
| Protein (Grams) | 6.73 | 7.29 | 7.53 | 7.79 |
| Fat (Grams) | 91.37 | 91.81 | 92.03 | 92.26 |
| Carbohydrate (Grams) | 22.38 | 21.46 | 21.00 | 20.54 |
| Energy (Kilo Calories) | 108 | 110 | 112 | 114 |

As given in Table II the nutrient content obtained for sambar with 20 per cent incorporation when compared with standard indicates that protein was increased by 1.06 grams and fat by 0.89 grams and carbohydrate was decreased by 1.84 grams and energy was increased by 6 Kilo calories.

Table III represents the nutrient content of kootu with different percentage of soya incorporation.

TABLE - III
NUTRIENT CONTENT OF KOOTU

| Nutrients | standard | percentage of soya added | | |
|---------------------------|----------|--------------------------|-------|-------|
| | | 10 | 15 | 20 |
| Protein (Grams) | 7.49 | 8.03 | 8.29 | 8.55 |
| Fat (Grams) | 91.60 | 92.04 | 92.26 | 92.44 |
| Carbohydrate (Grams) | 20.64 | 19.72 | 19.26 | 18.80 |
| Energy (Kilo calories) | 127 | 130 | 131 | 132 |

The nutrient composition acquired for kootu as presented in Table III denote that there was increase in 20 per cent incorporation as compared to standard in protein content by 1.1 grams, fat was increased by 0.84 grams carbohydrate content was decreased by 1.84 grams. The Total energy of kootu was increased by 5 kilo calories.

Table IV represents the nutrient content of iddli with different percentage of soya incorporation.

Table IV
NUTRIENT CONTENT OF IDDLI

| Nutrients | Standard | Percentage of soya added | | |
|---------------------------|----------|--------------------------|-------|-------|
| | | 10 | 15 | 20 |
| Protein (Grams) | 9.32 | 9.80 | 10.04 | 10.28 |
| Fat (Grams) | 15.57 | 16.03 | 16.25 | 16.48 |
| Carbohydrate (Grams) | 56.96 | 55.99 | 55.51 | 55.02 |
| Energy (Kilo Calories) | 398 | 400 | 401 | 402 |

As given in Table IV the nutrient content obtained for Iddli, shows that iddli with 20 per cent incorporation when compared with standard has increased protein, fat and total energy by 0.96, 0.91 grams and 4.00 kilo calories respectively. There was decrease in total carbohydrate content by 1.94 grams

Table V represents the nutrient content of Uthappam with different percentage of soya incorporation.

TABLE - V
NUTRIENT CONTENT OF UTHAPPAM

| Nutrients | standard | percentage of soya added | | |
|---------------------------|----------|--------------------------|-------|-------|
| | | 10 | 15 | 20 |
| Protein (Grams) | 4.32 | 4.51 | 4.70 | 4.70 |
| Fat (Grams) | 0.26 | 0.45 | 0.53 | 0.63 |
| Carbohydrate (Grams) | 29.66 | 29.27 | 29.08 | 28.66 |
| Energy (Kilo calories) | 138 | 138 | 139 | 140 |

As given in Table V the nutrient content obtained for Uthappam, shows that uthappam with 20 per cent incorporation when compared with standard has increased protein, fat and total energy by 0.38, 0.37 grams and 2.00 kilo calories respectively. There was decrease in total carbohydrate content by 1.00 grams

PLATE - I



EVALUATION OF SOYA INCORPORATED RECIPES BY THE PANEL MEMBERS

Usually when soya flour is incorporated there will be increase in total protein content, total ash content, total fat content and total calories content. This is supported by Jayalakshmi and Neelakantan (1987) who stated that "As the amount of incorporation increased there is increase in protein, ash, fat and calories".

This standardized recipes was prepared and given to selected panel members for obtaining of panel acceptability as shown in the plate I, II, III and IV.

(iii) Panel Evaluation of Selected Recipes

Table VI presents mean scores obtained for vadai in Industrial canteen I.

TABLE - VI
MEAN ACCEPTABILITY SCORES OBTAINED FOR VADAI IN INDUSTRIAL
CANTEEN I

(N=20)

| Quality attributes | Standard | Percentage of Soya Flour added | | |
|--------------------|----------|--------------------------------|-----|-----|
| | | 10 | 15 | 20 |
| Appearance | 2.9 | 3.0 | 2.7 | 2.4 |
| Colour | 3.0 | 3.0 | 2.8 | 2.5 |
| Flavour | 3.0 | 3.0 | 2.6 | 2.5 |
| Texture | 3.0 | 2.8 | 2.4 | 2.1 |
| Taste | 2.9 | 2.8 | 2.4 | 2.1 |
| Overall | 3.0 | 2.9 | 2.6 | 2.3 |

PLATE - II



VADAI

A = STANDARD

B = 10 PER CENT INCORPORATION OF SOYA

C = 15 PER CENT INCORPORATION OF SOYA

D = 20 PER CENT INCORPORATION OF SOYA

Soya Flour was incorporated in three different percentage as 10,15 and 20 per cent levels in vadai served in industrial Canteen I and compared the scores with the standard as shown in the Table VI (Figure I). The data obtained from the above Table VI indicates that the standard was highly acceptable as the scores were 3 out of 3. vadai with 10 per cent and 15 per cent were found to be acceptable as the standard but the vadai with 20 per cent incorporation of soya flour was least acceptable as the texture of the product was found to be hard when compared to the standard.

Table VII presents mean acceptability scores obtained for vadai in Industrial Canteen II.

TABLE - VII
MEAN ACCEPTABILITY SCORES OBTAINED FOR VADAI IN INDUSTRIAL
CANTEEN II

(N=20)

| Quality attributes | Standard | Percentage of Soya Flour added | | |
|--------------------|----------|--------------------------------|-----|-----|
| | | 10 | 15 | 20 |
| Appearance | 3.0 | 3.0 | 2.7 | 2.5 |
| Colour | 3.0 | 3.0 | 2.6 | 2.5 |
| Flavour | 2.9 | 2.8 | 2.5 | 2.4 |
| Texture | 2.9 | 2.8 | 2.6 | 2.2 |
| Taste | 2.9 | 2.7 | 2.3 | 1.8 |
| Overall | 2.9 | 2.8 | 2.6 | 2.3 |

PLATE - III



Sambar

A = STANDARD

B = 10 PER CENT INCORPORATION OF SOYA

C = 15 PER CENT INCORPORATION OF SOYA

D = 20 PER CENT INCORPORATION OF SOYA

FIGURE - I
ACCEPTABILITY SCORES OBTAINED FOR VADAI
SERVED IN INDUSTRIAL CANTEEN I

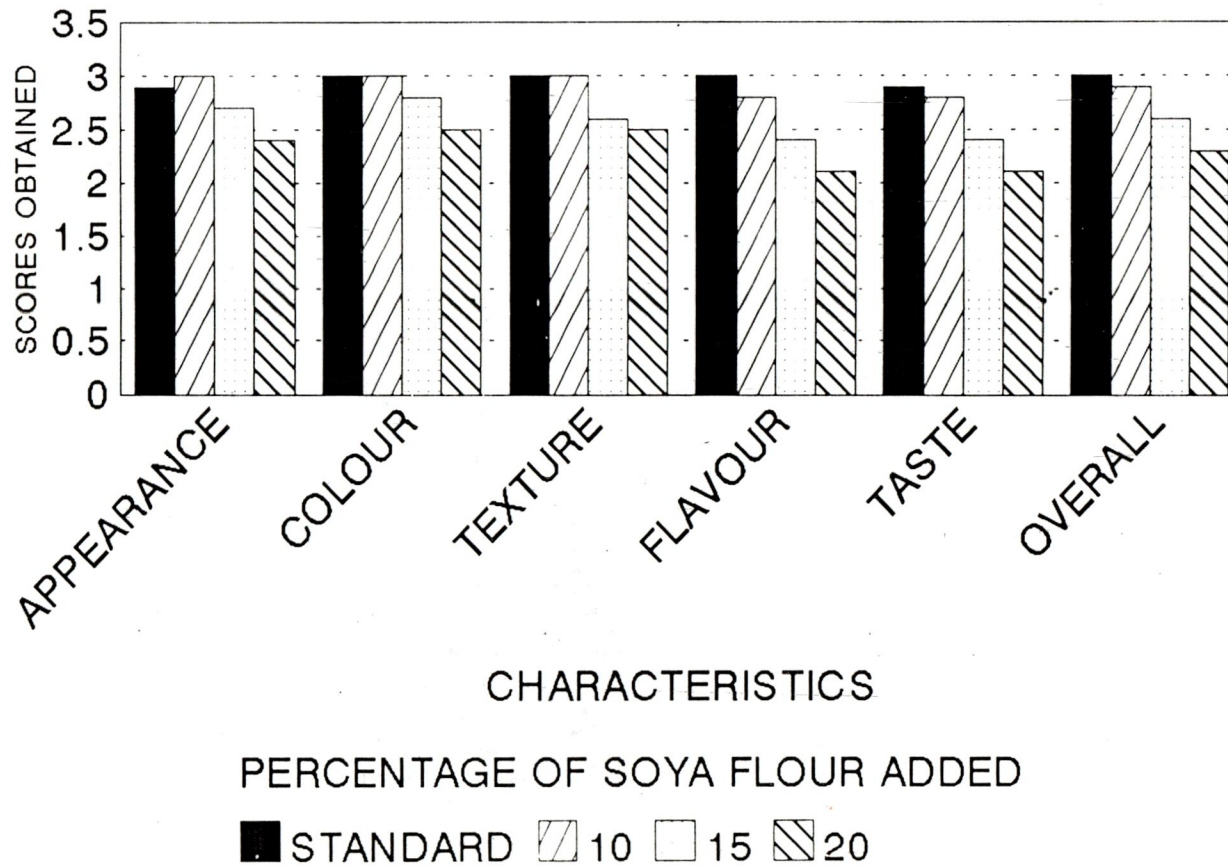
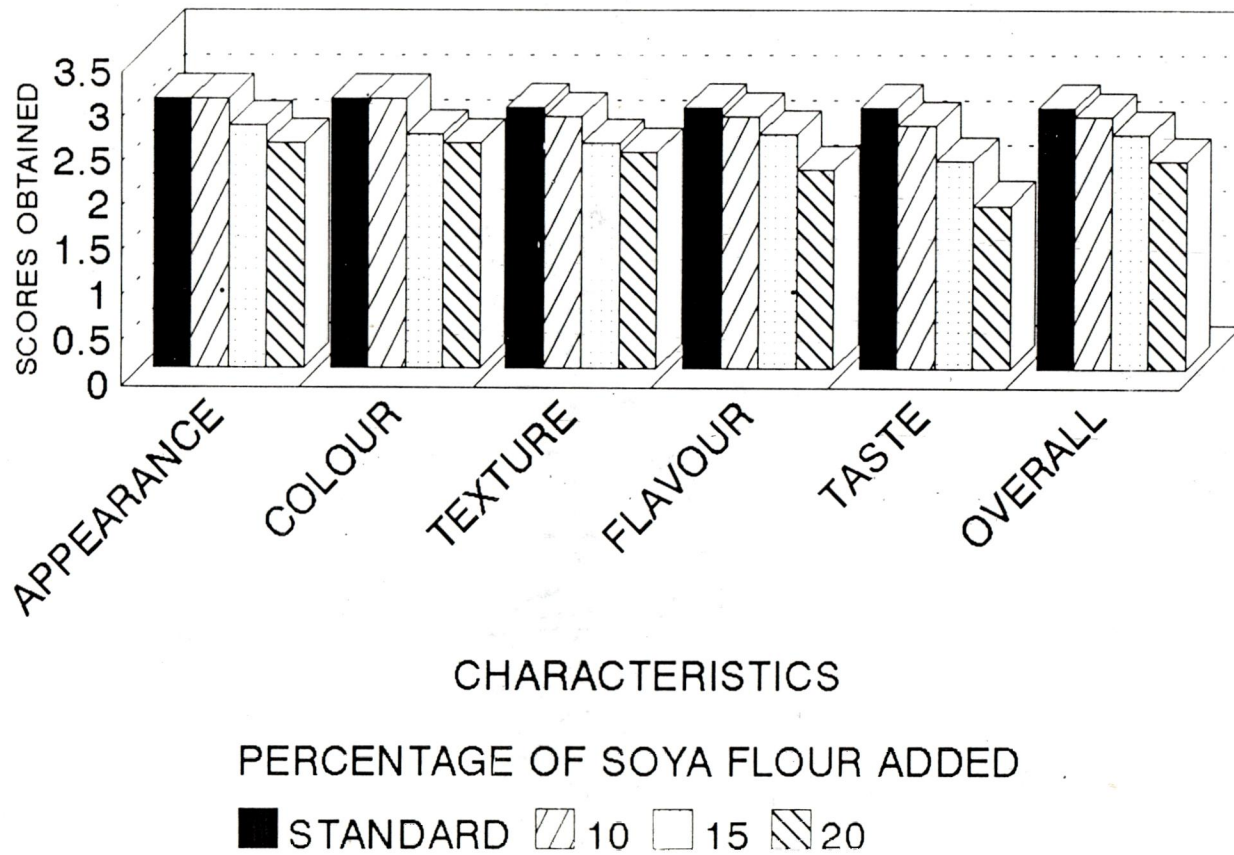


FIGURE - II
ACCEPTABILITY SCORES OBTAINED FOR VADAI
SERVED IN INDUSTRIAL CANTEEN II



As given in the Table VII (Figure II) the acceptability Scores obtained for vadai with 10 per cent incorporation of Soya Flour in Industrial Canteen II, indicates that the product was acceptable as standard. Vadai with 15 per cent and 20 per cent was less acceptable because of the change in texture and taste.

Table VIII presents mean acceptability scores obtained for sambar in industrial canteen I

TABLE - VIII
MEAN ACCEPTABILITY SCORES OBTAINED FOR SAMBAR INDUSTRIAL
CANTEEN I

| Quality attributes | Standard | Percentage of Soya Flour added | | |
|--------------------|----------|--------------------------------|-----|-----|
| | | 10 | 15 | 20 |
| Appearance | 2.8 | 2.7 | 2.4 | 1.9 |
| Colour | 2.8 | 2.7 | 2.3 | 1.9 |
| Flavour | 2.9 | 2.5 | 2.4 | 1.8 |
| Texture | 2.9 | 2.7 | 2.4 | 1.6 |
| Taste | 2.8 | 2.7 | 2.3 | 1.5 |
| Overall | 2.8 | 2.7 | 2.4 | 1.7 |

As given in the table VIII (Figure III) the acceptability Scores obtained for Sambar indicate that the 10 per cent incorporation of soya flour was found to be as acceptable as standard. The Sambar with 15 per cent and 20

FIGURE - III
ACCEPTABILITY SCORES OBTAINED FOR SAMBAR
SERVED IN INDUSTRIAL CANTEEN I

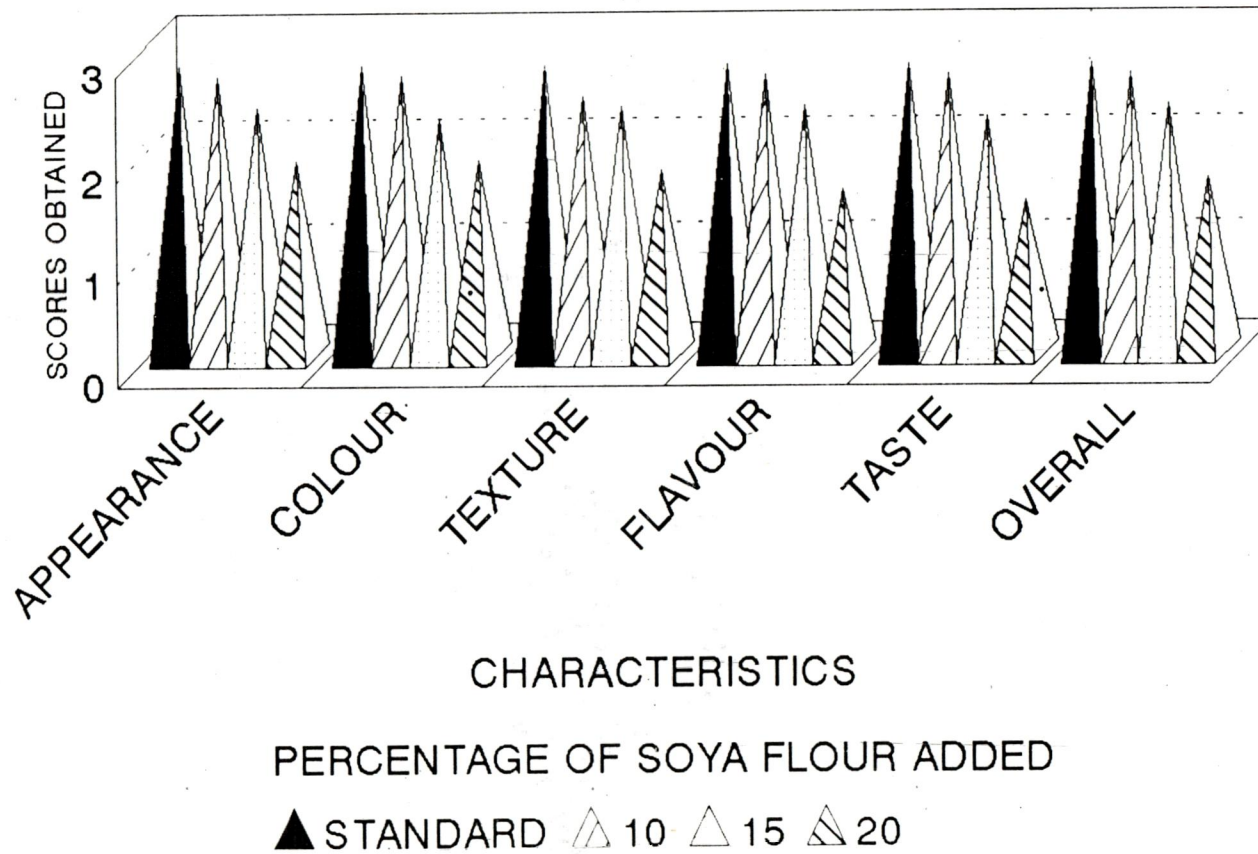
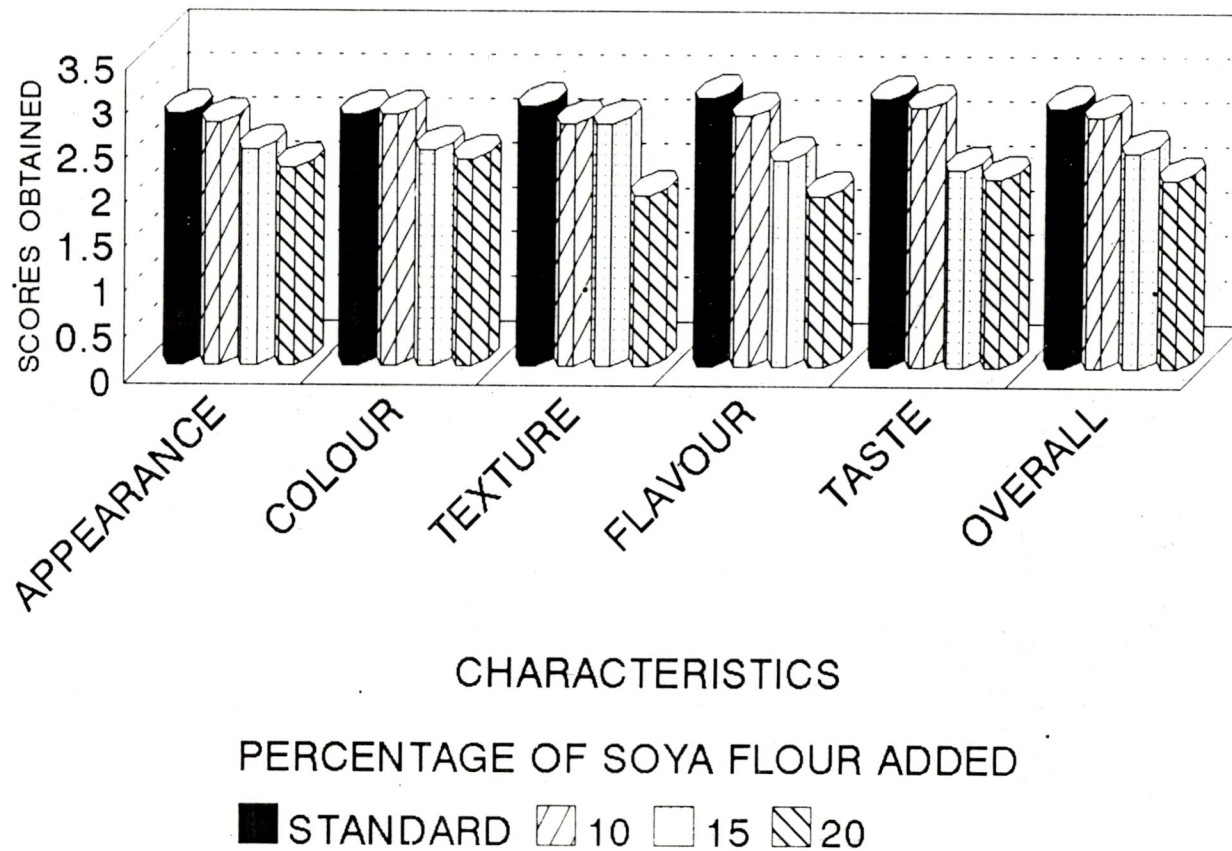


FIGURE - IV
ACCEPTABILITY SCORES OBTAINED FOR SAMBAR
SERVED IN INDUSTRIAL CANTEEN II



per cent incorporation of soya flour was slightly thick which reduced its acceptability.

Table IX presents mean acceptability Scores obtained for Sambar in Industrial Canteen II.

TABLE - IX
MEAN ACCEPTABILITY SCORES OBTAINED FOR SAMBAR IN INDUSTRIAL
CANTEEN II

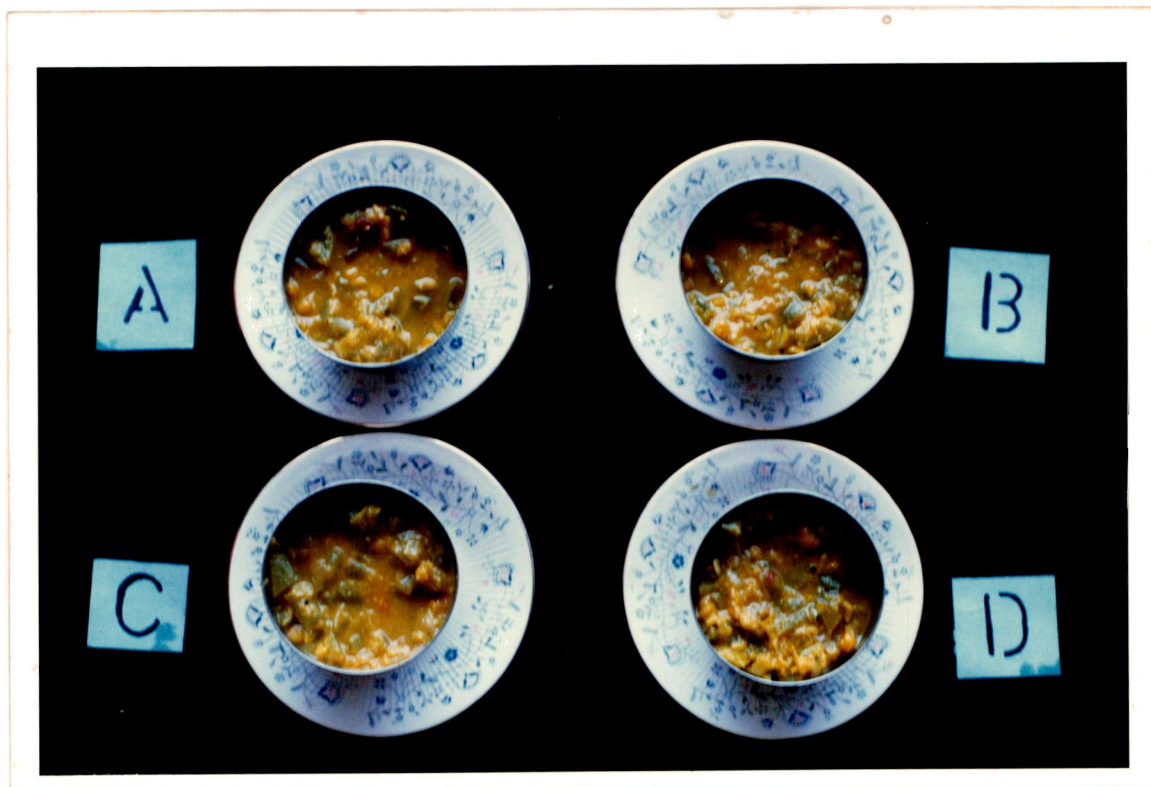
(N=20)

| Quality attributes | Standard | Percentage of Soya Flour added | | |
|--------------------|----------|--------------------------------|-----|-----|
| | | 10 | 15 | 20 |
| Appearance | 2.8 | 2.7 | 2.4 | 2.2 |
| Colour | 2.8 | 2.8 | 2.4 | 2.3 |
| Flavour | 2.9 | 2.7 | 2.7 | 1.9 |
| Texture | 3.0 | 2.8 | 2.3 | 1.9 |
| Taste | 3.0 | 2.9 | 2.3 | 2.1 |
| Overall | 2.9 | 2.8 | 2.4 | 2.1 |

The mean scores acquired for Sambar in Industrial Canteen II as presented in Table IX (Figure IV) denote that sambar with 10 per cent incorporation of Soya Flour was seemed to be as acceptable as standard rather than 15 and 20 per cent in corporation.

Table X presents mean acceptability Scores obtained for Kootu in Industrial canteen I..

PLATE - IV



KOOTU

A = STANDARD

B = 10 PER CENT INCORPORATION OF SOYA

C = 15 PER CENT INCORPORATION OF SOYA

D = 20 PER CENT INCORPORATION OF SOYA

TABLE - X
MEAN ACCEPTABILITY SCORES OBTAINED FOR KOOTU IN INDUSTRIAL
CANTEEN I

(N=20)

| Quality attributes | Standard | Percentage of Soya Flour added | | |
|--------------------|----------|--------------------------------|-----|-----|
| | | 10 | 15 | 20 |
| Appearance | 3.0 | 2.9 | 2.6 | 2.8 |
| Colour | 2.9 | 2.8 | 2.4 | 2.3 |
| Flavour | 2.9 | 2.8 | 2.5 | 2.1 |
| Texture | 2.8 | 2.9 | 2.5 | 2.1 |
| Taste | 3.0 | 2.8 | 2.4 | 2.1 |
| Overall | 2.9 | 2.8 | 2.5 | 2.3 |

The acceptability scores obtained for kootu in industrial canteen I as given in Table X (Figure V) indicate that the kootu with 10 per cent incorporation of soya flour was found to be as acceptable as standard. Among 15 and 20 per cent soya incorporated kootu 15 per cent was found to be more acceptable.

Table XI presents mean acceptability score obtained for Kootu in Industrial Canteen II.

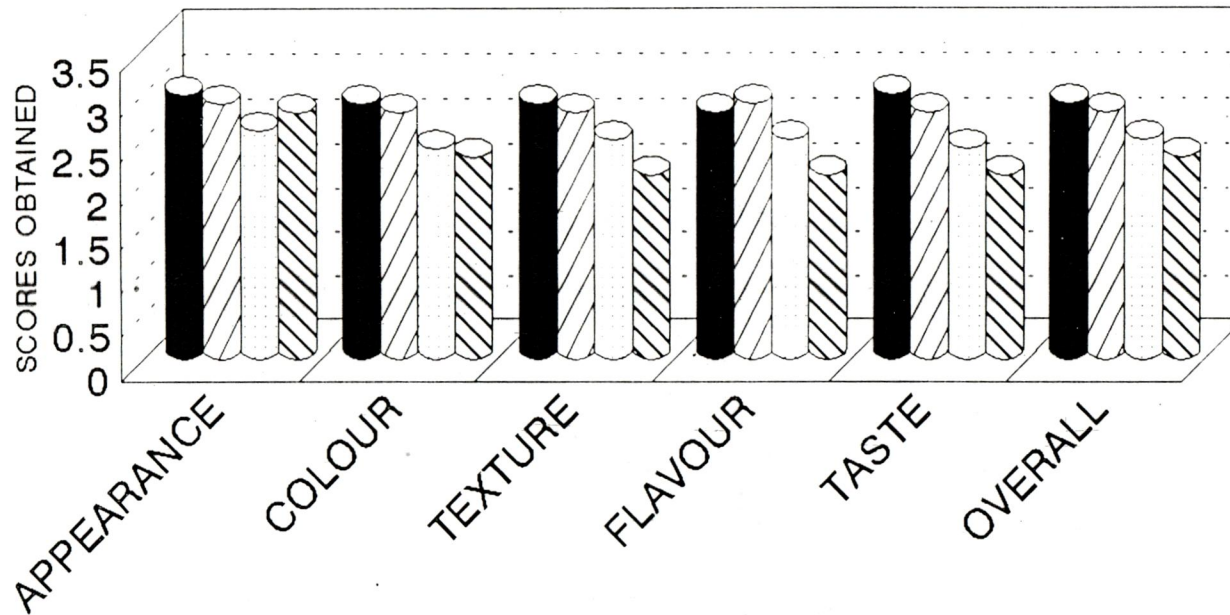
TABLE - XI

MEANS ACCEPTABILITY SCORE OBTAINED FOR KOOTU IN INDUSTRIAL
CANTEEN II

(N=20)

| Quality attributes | Standard | Percentage of Soya Flour added | | |
|--------------------|----------|--------------------------------|-----|-----|
| | | 10 | 15 | 20 |
| Appearance | 2.8 | 2.8 | 2.3 | 2.0 |
| Colour | 2.8 | 2.8 | 2.4 | 2.0 |
| Flavour | 2.9 | 2.7 | 2.3 | 2.1 |
| Texture | 2.9 | 2.7 | 2.2 | 1.9 |
| Taste | 2.9 | 2.8 | 2.5 | 2.0 |
| Overall | 2.9 | 2.8 | 2.3 | 2.0 |

FIGURE - V
ACCEPTABILITY SCORES OBTAINED FOR KOOTU
SERVED IN INDUSTRIAL CANTEEN I

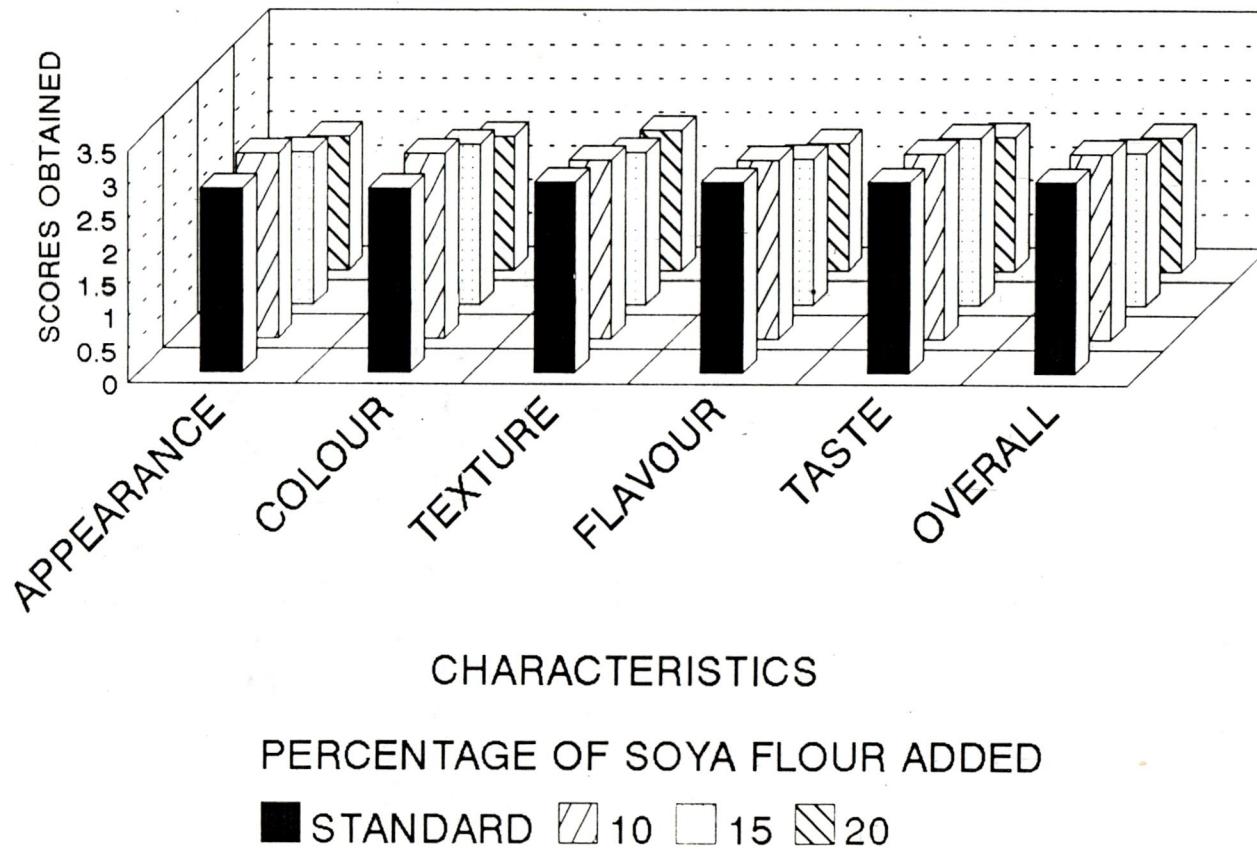


CHARACTERISTICS

PERCENTAGE OF SOYA FLOUR ADDED

■ STANDARD ▨ 10 □ 15 ▩ 20

FIGURE - VI
ACCEPTABILITY SCORES OBTAINED FOR KOOTU
SERVED IN INDUSTRIAL CANTEEN II



As given in Table XI (Figure VI) the acceptability Scores obtained for kootu in industrial canteen I indicate that kootu with 10 per cent incorporation of soya flour was found to be acceptable as standard rather than 15 and 20 per cent incorporation because of change in texture and flavour.

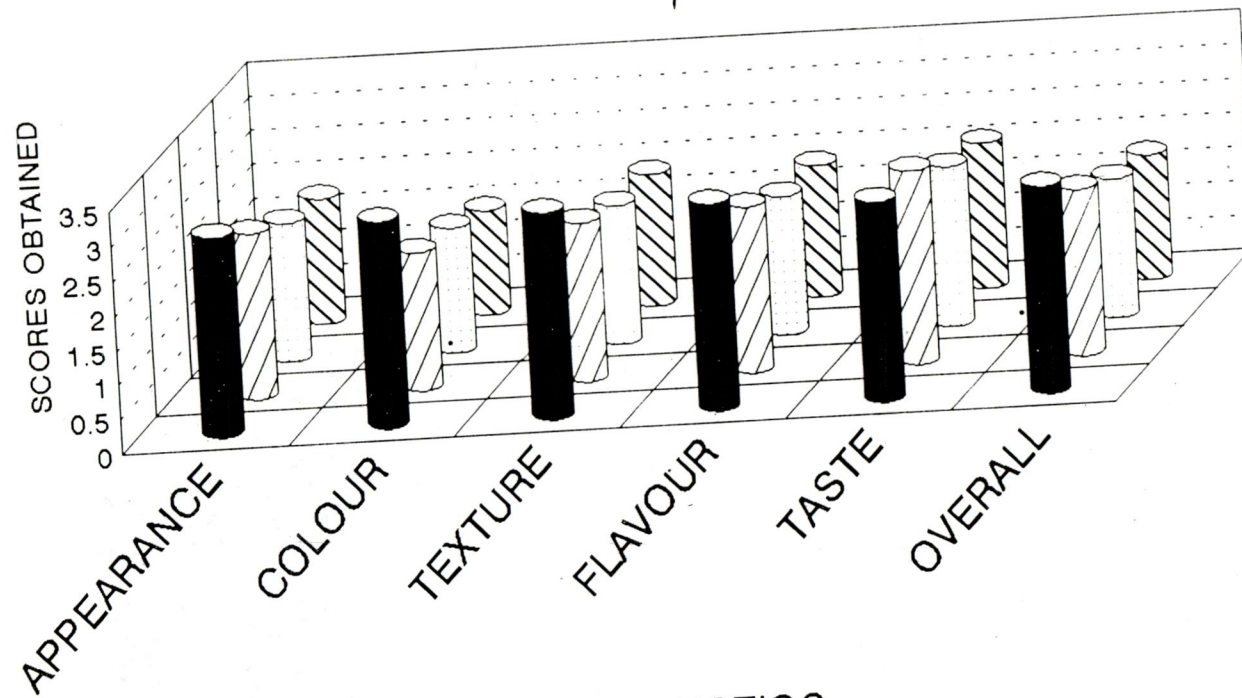
Table XII presents the mean acceptability score obtained for uthappam in Industrial Canteen I.

TABLE - XII
MEAN ACCEPTABILITY SCORES OBTAINED FOR UTHAPPAM IN INDUSTRIAL
CANTEEN I

| Quality attributes | Standard | Percentage of Soya Flour added | | |
|--------------------|----------|--------------------------------|-----|-----|
| | | 10 | 15 | 20 |
| Appearance | 2.9 | 2.4 | 2.0 | 1.8 |
| Colour | 3.0 | 2.0 | 1.8 | 1.5 |
| Flavour | 3.0 | 2.3 | 2.0 | 1.9 |
| Texture | 3.0 | 2.4 | 2.0 | 1.9 |
| Taste | 2.9 | 2.8 | 2.3 | 2.1 |
| Overall | 3.0 | 2.4 | 2.0 | 1.8 |

As given in Table XII (Figure VII) the acceptability scores acquired for uthappam in industrial canteen I denotes that the standard was highly acceptable. The data also revealed that 10,15 and 20 per cent

FIGURE - VII
ACCEPTABILITY SCORES OBTAINED FOR UTHAPPAM
SERVED IN INDUSTRIAL CANTEEN I



CHARACTERISTICS

PERCENTAGE OF SOYA FLOUR ADDED

■ STANDARD ▨ 10 □ 15 ▩ 20

incorporation were not acceptable as standard. Since addition of Soya flour caused yellowish colour which decreased its acceptability. This is supported by Mudambi, (1990) "Colour affects our acceptance of food. The initial attraction or rejection of food depends on the impression of food on its looks".

Table XIII presents mean acceptability scores obtained for Iddli in industrial Canteen II.

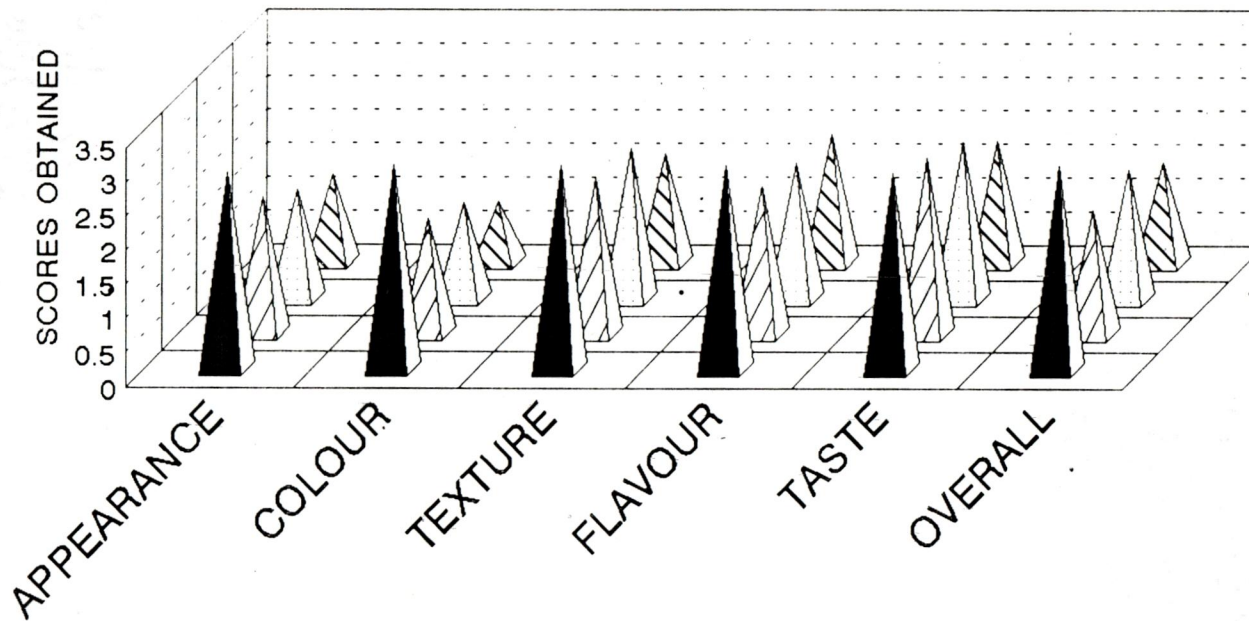
TABLE - XIII
MEAN ACCEPTABILITY SCORES OBTAINED FOR IDDLI IN INDUSTRIAL
CANTEEN II.

(N=20)

| Quality attributes | Standard | Percentage of Soya Flour added | | |
|--------------------|----------|--------------------------------|-----|-----|
| | | 10 | 15 | 20 |
| Appearance | 3.0 | 2.0 | 1.6 | 1.3 |
| Colour | 2.9 | 1.6 | 1.4 | 0.9 |
| Flavour | 2.8 | 2.4 | 2.2 | 1.6 |
| Texture | 2.8 | 2.3 | 2.3 | 1.8 |
| Taste | 3.0 | 2.6 | 2.3 | 1.8 |
| Overall | 2.9 | 2.2 | 2.0 | 1.5 |

As given in Table XIII (Figure VIII) the acceptability scores obtained for iddli in industrial canteen II indicate that the standard was highly acceptable when compared to 10, 15 and 20 per cent of incorporation of soya flour. Acceptability of soya incorporated products decreased because addition of soya flour caused change in colour and Texture. This is supported by the study conducted by Thandon et al. (1987) revealing that the rehydration

FIGURE - VIII
ACCEPTABILITY SCORES OBTAINED FOR IDDLI
SERVED IN INDUSTRIAL CANTEEN II



CHARACTERISTICS

PERCENTAGE OF SOYA FLOUR ADDED

▲ STANDARD △ 10 △ 15 △ 20

became poor because of Soya fortification rendering the product hard in texture.

B) Acceptability of Selected Recipes by the Industrial Workers

Since the recipes with 10 per cent incorporation of Soya flour was found to be more acceptable when compared to the 15 and 20 per cent incorporation vadai, sambar and kootu with 10 per cent incorporation of soya flour was prepared and given to the clientele in industrial canteen I and II as shown in the plate V.

Table XIV presents mean acceptability scores obtained from the clientele of two industrial canteens.

TABLE - XIV
MEAN ACCEPTABILITY SCORES OBTAINED FROM THE CLIENTELE
OF TWO INDUSTRIAL CANTEENS
(N=150 for each recipes)

| Quality attributes | Industrial Canteen I | | | Industrial Canteen II | | | F Ratio | |
|--------------------|----------------------|--------|-------|-----------------------|--------|-------|---------------|------------------|
| | Vadai | Sambar | Kootu | Vadai | Sambar | kootu | Between Items | Between Canteens |
| Appearance | 2.5 | 2.5 | 2.4 | 2.5 | 2.3 | 2.5 | <1 ns | <1 ns |
| Colour | 3.0 | 2.5 | 2.5 | 2.9 | 2.4 | 2.5 | 286.188* | 4.71 ns |
| Flavour | 2.4 | 2.6 | 2.5 | 2.4 | 2.4 | 2.5 | 2.98 ns | <1 ns |
| Texture | 3.0 | 2.5 | 2.5 | 2.9 | 2.4 | 2.5 | 206.30* | 1.5 ns |
| Taste | 2.4 | 2.6 | 2.6 | 2.5 | 2.4 | 2.6 | 2.23 ns | <1 ns |
| Overall | 2.9 | 2.6 | 2.5 | 2.8 | 2.4 | 2.5 | 272.42* | <1 ns |

ns = not Significantly different

* = Significantly different at 5 per cent level.

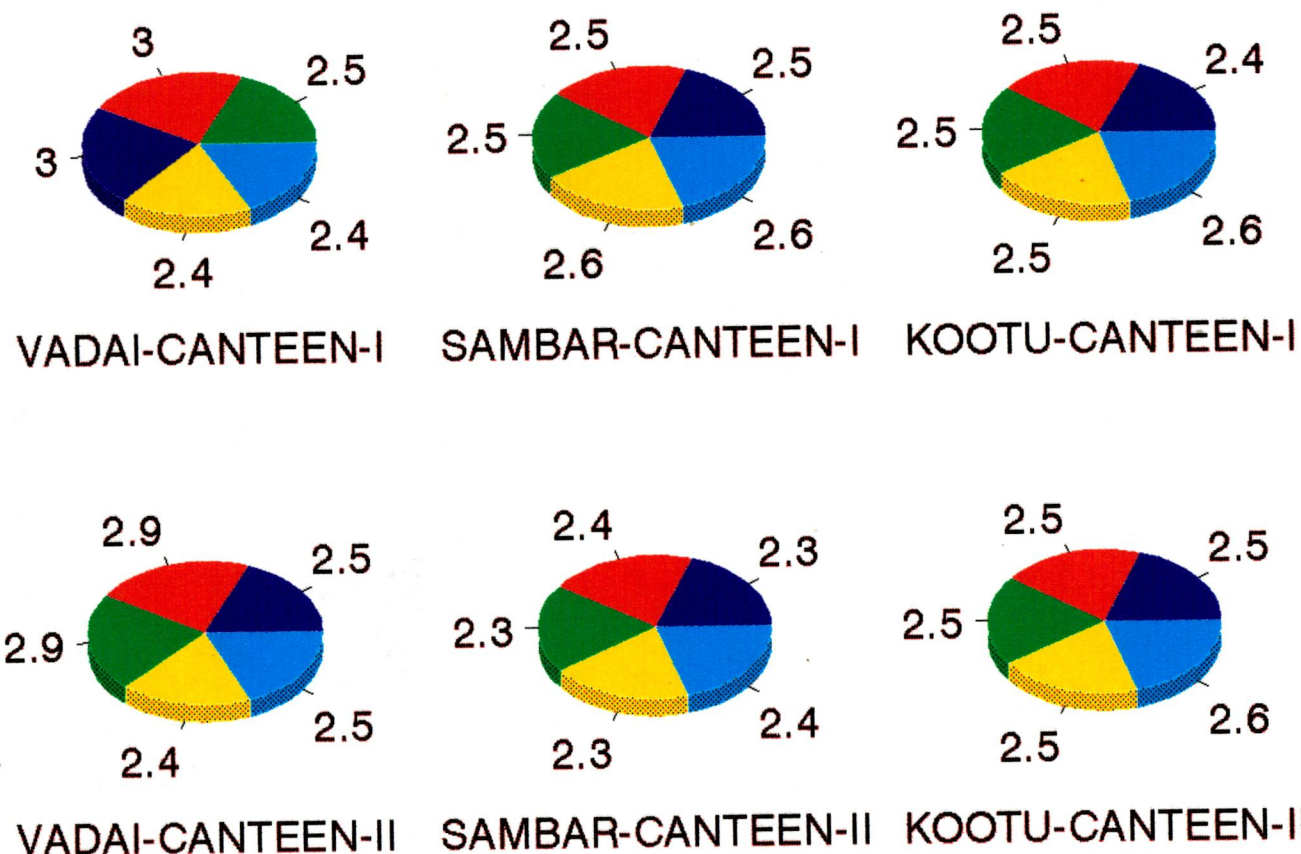
PLATE - V



Full meals with soya incorporated recipes (vadai, sambar and kootu) with 10 per cent incorporation of soya for clientele evaluation

As given in Table XIV (Figure IX) the acceptability of the product was compared quality attribute vice between products and between two industrial canteens. The product was evaluated statistically based on F - Ratio. The statistical analysis between items revealed that the appearance, flavour, taste were not significantly different but colour and texture was found to be significantly different at 5 per cent level. When quality attributes were compared between products when the two industrial canteens were compared by statistical analysis. It was found that the F - Ratio for all attributes like appearance, colour, texture flavour taste and overall were found to be significantly different either at five per cent or at one per cent level. Thus the product was found to be acceptable at 10 per cent of Soya flour incorporation. This fact was supported by Nick (1991) who stated that the incorporation of soya flour from 0.5 to 7 per cent for dishes were found to be similar and effective as the standard.

FIGURE-IX
ACCEPTABILITY SCORES OBTAINED FOR VADAI, SAMBAR AND KOOTU INCORPORATED WITH TEN PER CENT DEFATTED SOYA FLOUR IN INDUSTRIAL CANTEEN I AND II



■ APPEARANCE
 ■ COLOUR
 ■ TEXTURE
 ■ FLAVOUR
 ■ TASTE

Summary and Conclusion

SUMMARY AND CONCLUSION

Industrial workers are one of foremost important group which is responsible for national economy and food served in industrial canteens for these people is usually lacking in protein since Indian's menu preference lies usually on carbohydrate rich food rather than protein rich foods.

So the study entitled " Incorporation of Soya in Selected Recipes in Two Industrial Canteens and Their Acceptability" was aimed at incorporating defatted soya flour in traditional Indian recipes and their acceptability. As the number of industries and their workers was high in "Southern Manchester of India", Coimbatore, two Industrial Canteens namely "Cheran Transport Corporation" and "Bimetal Bearing Limited" were selected to conduct the study.

Soya flour was incorporated in traditional items like vadai, sambar, kootu, iddli and uthappam, in two industrial canteens so as to increase protein content.

Panel evaluation was conducted with selected panel members by incorporating defatted soya flour at 10, 15 and 20 per cent level in vadai, sambar, kootu, iddli, uthappam. Score cards with 3 point scale were used to find out the acceptability. Selected recipes except iddli and uthappam were accepted with 10 per cent soya flour incorporation as standard. There was slight change in colour and appearance

which reduced acceptability of iddli and uthappam, hence only sambar, kottu and vadai were prepared with 10 percent soya flour incorporation and presented to selected clientele. Each recipe was repeated for three consecutive days in Bimetal Bearing and Cheran Transport Corporation, 150 clientele assessed the acceptability of quality attributes like appearance, colour, texture, flavour and taste.

The scores were also analysed statistically and F - ratio indicated that there was no significant difference in the mean acceptability of vadai, sambar and kootu between two industrial canteens at five per cent and one per cent level. The overall ratio of acceptance between the recipes was found to be significant at five per cent level.

Thus the results of the study indicates that the traditional recipes were acceptable upto 10 per cent incorporation of defatted soya flour.

Recommendations

A. For Industrial Canteen

As soya was found to be easily acceptable upto ten per cent, it can be incorporated in the items that are sold in industrial canteens in order increase the protein content of the items served there, which will help in improving the nutritional status of workers and to increase their work output.

B. For Government

Large scale use of defatted soya flour that could enable an upgrading of the protein level of a widely used item of food would be the fortification of wheat atta. Such products could be easily produced in the large flour mills and made available through the public distribution system.

Encouragement of the direct purchase of soya flour at the consumers level, for home level fortification of various food preparations could also result in an expanded usage with little cost increment to the consumer.

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Appendices

APPENDIX - I

I STANDARDISATION OF SELECTED TRADITIONAL RECIPES"

VADAI

| Ingredients | Quantity |
|--------------------|-----------------|
| Blackgram dhal | 60 grams |
| Curry leaves | 5 grams |
| Onion (big) | 10 grams |
| Chillies (green) | 5 grams |
| Pepper (dry) | 3 grams |
| Cooking oil | 15 grams |

Method

1. Chop onions, chillies, curry leaves finely.
2. Soak blackgram dhal for half an hour. grind with water into a smooth batter.
3. Add onions, chillies curry leaves and pepper and salt and mix well.
4. Shape in balls with a hole in centre.
5. Deep fry till crisp and cook.

IDDLI

| Ingredients | Quantity |
|-------------------------|-----------------|
| Rice (parboiled milled) | 30.00 grams |
| Blackgram dhal | 10.00 grams |

Method

1. Wash and soak rice for about 30 minutes.
2. Grind coarsely the above.
3. Soak gram for one hour and grind till it is light and frothy.
4. Mix ground rice, gram, salt and a little water and keep it overnight.
5. Steam it in idlli steamer.

UTHAPPAM

| Ingredients | Quantity |
|--------------------|-----------------|
| Rice (parboiled) | 50.00 grams |
| Blackgram dhal | 25.00 grams |
| Onion (big) | 5.00 grams |
| Chillies | 2.00 grams |
| Cooking oil | 15.00 grams |

Method

1. Chop green chillies and onion.
2. Soak rice and blackgram dhal in water in separate vessel overnight.
3. Grind them separately.
4. Grind blackgram finely and rice coarsely.
5. Mix these two paste and allow them to ferment atleast for 24 hours.
6. Add green chillies, onions and salt to paste.
7. Shallow fry laddle full of the paste in oil on a tava as for dosai.

KOOTU

| Ingredients | Quantity |
|--------------------|-----------------|
| Redgram dhal | 25.00 grams |
| Snakegourd | 100.00 grams |
| Mustard | 2.00 grams |
| Blackgram dhal | 4.00 grams |
| Chillies (green) | 2.5 grams |
| Cooking oil | 10.00 grams |

Method

1. Wash and chop snakegourd.
2. Cook redgram dhal with enough water for 15 minutes and mash well.
3. Heat oil add the seasonings, when it crackles add the chopped snakegourd, mashed dhal, chilli powder, water and salt to taste. Cook untill thick.

SAMBAR

| Ingredients | Quantity |
|--------------------|-----------------|
| Redgram dhal | 25.00 grams |
| Onion (small) | 10.00 grams |
| Brinjal | 25.00 grams |
| Blackgram dhal | 5.00 grams |
| Mustard seeds | 2.00 grams |
| Chillies (green) | 2.50 grams |
| Coriander | 2.50 grams |
| Tomato ripe | 10.00 grams |
| Cooking oil | 10.00 grams |

Method

1. Chop Brinjal, onions and tomatoes.
2. Heat oil in a pan, fry the chopped ingredients, add water and boil till soft.
3. Cook the dhal with water and mash it.
4. Mix the boiled vegetable with the dhal and add chilli powder.
5. Remove from fire and if needed garnish with curry leaves and coriander leaves.

APPENDIX - II

COMPOSITION OF SELECTED RECIPES

COMPOSITION OF VADAI

| Ingredients | Amount in grams | | | |
|----------------|-----------------|--|----|----|
| | Standard | Percentage incorporation of soya flour | | |
| | | 10 | 15 | 20 |
| Blackgram dhal | 60 | 54 | 51 | 48 |
| Soya beans | 0 | 6 | 9 | 12 |
| Curry leaves | 5 | 5 | 5 | 5 |
| Onion big | 10 | 10 | 10 | 10 |
| Chillies green | 5 | 5 | 5 | 5 |
| Pepper dry | 3 | 3 | 3 | 3 |
| Cooking oil | 15 | 15 | 15 | 15 |

APPENDIX - III

COMPOSITION OF SAMBAR

| Ingredients | Amount in grams | | | |
|------------------|-----------------|--|-------|-----|
| | Standard | Percentage incorporation of soya flour | | |
| | | 10 | 15 | 20 |
| Redgram dhal | 25 | 22.5 | 21.25 | 20 |
| Soya bean | 0 | 2.5 | 3.75 | 5 |
| Onion (Small) | 10 | 10 | 10 | 10 |
| Brinjal | 25 | 25 | 2.5 | 25 |
| Mustard seed | 2 | 2 | 2 | 2 |
| Chillies (green) | 2.5 | 2.5 | 2.5 | 2.5 |
| Coriander | 2.5 | 2.5 | 2.5 | 2.5 |
| Tomato ripe | 10 | 10 | 10 | 10 |
| Cooking oil | 10 | 10 | 10 | 10 |

APPENDIX - IV
COMPOSITION OF KOOTU

| Ingredients | Amount in grams | | | |
|------------------|-----------------|---|-------|-----|
| | Standard | Percentage incorporation of soya flour | | |
| | | 10 | 15 | 20 |
| Redgram dhal | 25 | 22.5 | 21.75 | 20 |
| Soya beans | | 25 | 3.75 | 5 |
| Blackgram dhal | 4 | 4 | 4 | 4 |
| Snake gourd | 100 | 100 | 100 | 100 |
| Mustard | 2 | 2 | 2 | 2 |
| Chillies (green) | 2.5 | 2.5 | 2.5 | 2.5 |
| Cooking oil | 10 | 10 | 10 | 10 |

APPENDIX - V

COMPOSITION OF UTHAPPAM

| Ingredients | Amount in grams | | | |
|-----------------------|-----------------|---|-------|----|
| | Standard | Percentage incorporation of soya flour | | |
| | | 10 | 15 | 20 |
| Rice parboiled milled | 50 | 50 | 50 | 50 |
| Blackgram dhal | 25 | 22.5 | 21.25 | 20 |
| Soya bean | 0 | 2.5 | 3.75 | 5 |
| Onion (big) | 5 | 5 | 5 | 5 |
| Chillies (green) | 2 | 2 | 2 | 2 |
| Cooking oil | 15 | 15 | 15 | 15 |

APPENDIX - VI

COMPOSITION OF IDDLI

| Ingredients | Amount in grams | | | |
|-----------------------|-----------------|---|-----|----|
| | Standard | Percentage incorporation of soya flour | | |
| | | 10 | 15 | 20 |
| Rice parboiled milled | 30 | 30 | 30 | 30 |
| Blackgram dhal | 10 | 9 | 8.5 | 8 |
| Soya bean | 0 | 1 | 1.5 | 2 |

APPENDIX - VI

அவினாசிலிங்கம் மனையியல் மற்றும் பெண்கள் உயர் கல்வி நிறுவனம் SCORE CARD FOR PANEL EVALUATION

| CHARACTER தன்மைகள் | SCORE மதிப்பெண்கள் | GOOD நன்று | FAIR சுமார் | POOR திருப்தி இல்லை |
|-----------------------|-----------------------|---------------|----------------|---------------------------|
| Appearance தோற்றம் | O | | | |
| | A | | | |
| | B | | | |
| | C | | | |
| Colour நிறம் | O | | | |
| | A | | | |
| | B | | | |
| | C | | | |
| Flavour மணம் | O | | | |
| | A | | | |
| | B | | | |
| | C | | | |
| Texture தன்மை | O | | | |
| | A | | | |
| | B | | | |
| | C | | | |
| Taste சுவை | O | | | |
| | A | | | |
| | B | | | |
| | C | | | |

APPENDIX - VIII - A

அவினாசிலிங்கம் மனையியல் மற்றும் பெண்கள் உயர் கல்வி நிறுவனம் SCORE CARD FOR CLIENTELE EVALUATION

கூட்டு/சாம்பார்

தன்மைகள்

கருத்து

1. தோற்றம்

மிக நன்று

நன்று

சுமார்

2. நிறம்

மிக நன்று

நன்று

சுமார்

3. தன்மை

மிக நன்று

நன்று

சுமார்

4. மணம்

மிக நன்று

நன்று

சுமார்

5. சுவை

மிக நன்று

நன்று

சுமார்

APPENDIX -VIII -B

அவினாசிலிங்கம் மனையியல் மற்றும் பெண்கள் உயர் கல்வி நிறுவனம் SCORE CARD FOR CLIENTELE EVALUATION

வடை

| தன்மைகள் | கருத்து |
|----------------|----------------------|
| 1. தோற்றம் | |
| மிக நன்று | <input type="text"/> |
| நன்று | <input type="text"/> |
| சுமார் | <input type="text"/> |
| 2. நிறம் | |
| பொன்னிறம் | <input type="text"/> |
| காப்பிகலர் | <input type="text"/> |
| தீயந்தது | <input type="text"/> |
| 3. தன்மை | |
| மிருதுவானது | <input type="text"/> |
| எண்ணெய் ஊறியது | <input type="text"/> |
| கடினமானது | <input type="text"/> |
| 4. மணம் | |
| மிக நன்று | <input type="text"/> |
| நன்று | <input type="text"/> |
| சுமார் | <input type="text"/> |
| 5. சுவை | |
| மிக நன்று | <input type="text"/> |
| நன்று | <input type="text"/> |
| சுமார் | <input type="text"/> |

APPENDIX - IX

ACCEPTABILITY SCORES OBTAINED FOR VADAI BY PANEL MEMBERS IN
INDUSTRIAL CANTEEN I

| Character | Score | Good | Fair | Poor |
|------------|-------|------|------|------|
| Appearance | O | 18 | 2 | - |
| | A | 19 | 1 | - |
| | B | 14 | 6 | - |
| | C | 10 | 8 | 2 |
| Colour | O | 19 | 1 | - |
| | A | 19 | 1 | - |
| | B | 15 | 5 | - |
| | C | 13 | 3 | 4 |
| Flavour | O | 19 | 1 | - |
| | A | 19 | 1 | - |
| | B | 12 | 8 | - |
| | C | 12 | 6 | 2 |
| Texture | O | 19 | 1 | - |
| | A | 17 | 2 | 1 |
| | B | 7 | 13 | - |
| | C | 6 | 10 | 4 |
| Taste | O | 18 | 2 | - |
| | A | 16 | 4 | - |
| | B | 9 | 10 | 1 |
| | C | 5 | 12 | 3 |

APPENDIX - X

ACCEPTABILITY SCORES OBTAINED FOR VADAI BY PANEL MEMBERS IN
INDUSTRIAL CANTEEN II

| Character | Score | Good | Fair | Poor |
|------------|-------|------|------|------|
| Appearance | 0 | 20 | - | |
| | A | 20 | - | - |
| | B | 13 | 7 | - |
| | C | 11 | 8 | 1 |
| Colour | 0 | 20 | - | |
| | A | 20 | - | - |
| | B | 12 | 8 | - |
| | C | 12 | 6 | 2 |
| Flavour | 0 | 18 | 2 | |
| | A | 15 | 5 | - |
| | B | 10 | 10 | - |
| | C | 9 | 10 | 1 |
| Texture | 0 | 18 | 2 | |
| | A | 17 | 3 | - |
| | B | 12 | 8 | - |
| | C | 4 | 15 | 1 |
| Taste | 0 | 18 | 2 | |
| | A | 13 | 7 | - |
| | B | 6 | 14 | - |
| | C | 7 | 11 | 2 |

APPENDIX - XI

ACCEPTABILITY SCORES OBTAINED FOR SAMBAR BY PANEL MEMBERS IN
INDUSTRIAL CANTEEN I

| Character | Score | Good | Fair | Poor |
|------------|-------|------|------|------|
| Appearance | 0 | 15 | 5 | - |
| | A | 13 | 7 | - |
| | B | 9 | 10 | 1 |
| | C | 5 | 8 | 7 |
| Colour | 0 | 15 | 5 | - |
| | A | 14 | 6 | - |
| | B | 7 | 12 | 4 |
| | C | 4 | 10 | 6 |
| Flavour | 0 | 15 | 5 | 2 |
| | A | 12 | 6 | 2 |
| | B | 7 | 13 | - |
| | C | 4 | 7 | 9 |
| Texture | 0 | 15 | 5 | - |
| | A | 13 | 7 | - |
| | B | 9 | 10 | 1 |
| | C | 1 | 9 | 10 |
| Taste | 0 | 15 | 15 | - |
| | A | 13 | 7 | - |
| | B | 7 | 11 | 2 |
| | C | 1 | 7 | 12 |

APPENDIX - XII

ACCEPTABILITY SCORES OBTAINED FOR SAMBAR BY PANEL MEMBERS IN
INDUSTRIAL CANTEEN II

| Character | Score | Good | Fair | Poor |
|------------|-------|------|------|------|
| Appearance | 0 | 18 | 2 | |
| | A | 14 | 6 | 0 |
| | B | 9 | 10 | 1 |
| | C | 6 | 11 | 3 |
| Colour | 0 | 18 | 2 | |
| | A | 16 | 4 | 0 |
| | B | 8 | 12 | 0 |
| | C | 8 | 9 | 3 |
| Flavour | 0 | 18 | 2 | |
| | A | 15 | 5 | - |
| | B | 16 | 12 | 2 |
| | C | 3 | 12 | 5 |
| Texture | 0 | 19 | 1 | |
| | A | 16 | 4 | - |
| | B | 8 | 10 | 2 |
| | C | 2 | 13 | 5 |
| Taste | 0 | 18 | 2 | |
| | A | 17 | 3 | - |
| | B | 7 | 10 | 3 |
| | C | 5 | 12 | 3 |

APPENDIX - XIII

ACCEPTABILITY SCORES OBTAINED FOR KOOTU BY PANEL MEMBERS IN
INDUSTRIAL CANTEEN I

| Character | Score | Good | Fair | Poor |
|------------|-------|------|------|------|
| Appearance | 0 | 19 | 1 | |
| | A | 17 | 3 | - |
| | B | 14 | 3 | 3 |
| | C | 16 | 4 | - |
| Colour | 0 | 19 | 1 | |
| | A | 15 | 5 | - |
| | B | 11 | 6 | 3 |
| | C | 11 | 4 | 5 |
| Flavour | 0 | 19 | 1 | |
| | A | 15 | 5 | - |
| | B | 11 | 7 | 2 |
| | C | 3 | 15 | 2 |
| Texture | 0 | 19 | 1 | |
| | A | 18 | 2 | - |
| | B | 11 | 8 | 1 |
| | C | 2 | 17 | 1 |
| Taste | 0 | 19 | 1 | - |
| | A | 15 | 5 | - |
| | B | 10 | 8 | 2 |
| | C | 3 | 16 | 1 |

APPENDIX - XIV

ACCEPTABILITY OBTAINED FOR KOOTU BY PANEL MEMBERS IN
INDUSTRIAL CANTEEN II

| Character | Score | Good | Fair | Poor |
|------------|-------|------|------|------|
| Appearance | 0 | 18 | 2 | |
| | A | 15 | 5 | - |
| | B | 7 | 12 | 1 |
| | C | 4 | 12 | 4 |
| Colour | 0 | 18 | 2 | |
| | A | 15 | 5 | - |
| | B | 7 | 13 | - |
| | C | 3 | 13 | 4 |
| Flavour | 0 | 19 | 1 | |
| | A | 15 | 4 | 1 |
| | B | 8 | 10 | 2 |
| | C | 7 | 8 | 4 |
| Texture | 0 | 19 | 1 | |
| | A | 15 | 3 | 2 |
| | B | 6 | 12 | 2 |
| | C | 3 | 12 | 5 |
| Taste | 0 | 19 | 1 | |
| | A | 16 | 4 | - |
| | B | 10 | 9 | 1 |
| | C | 6 | 8 | 6 |

APPENDIX - XV

ACCEPTABILITY SCORES OBTAINED FOR UTHAPPAM BY PANEL MEMBERS IN
INDUSTRIAL CANTEEN I

| Character | Score | Good | Fair | Poor |
|------------|-------|------|------|------|
| Appearance | 0 | 18 | 2 | |
| | A | 7 | 13 | - |
| | B | 3 | 14 | 3 |
| | C | 2 | 11 | 7 |
| Colour | 0 | 19 | 1 | |
| | A | 4 | 12 | 4 |
| | B | 1 | 13 | 6 |
| | C | 1 | 8 | 11 |
| Flavour | 0 | 19 | 1 | |
| | A | 8 | 9 | 3 |
| | B | 3 | 13 | 5 |
| | C | 4 | 9 | 7 |
| Texture | 0 | 19 | 1 | |
| | A | 6 | 14 | 1 |
| | B | 4 | 12 | 4 |
| | C | 4 | 10 | 6 |
| Taste | 0 | 18 | 2 | |
| | A | 3 | 10 | 4 |
| | B | 4 | 10 | 6 |
| | C | 4 | 7 | 9 |

APPENDIX - XVI

ACCEPTABILITY OBTAINED FOR IDDLI BY PANEL MEMBERS IN
INDUSTRIAL CANTEEN II

| Character | Score | Good | Fair | Poor |
|------------|-------|------|------|------|
| Appearance | 0 | 20 | 0 | |
| | A | 3 | 14 | 3 |
| | B | 1 | 9 | 10 |
| | C | - | 5 | 15 |
| Colour | 0 | 19 | 1 | |
| | A | - | 14 | 6 |
| | B | - | 8 | 12 |
| | C | - | 6 | 14 |
| Flavour | 0 | 18 | 2 | |
| | A | 9 | 9 | 2 |
| | B | 5 | 13 | 2 |
| | C | 2 | 12 | 6 |
| Texture | 0 | 18 | 2 | |
| | A | 11 | 9 | - |
| | B | 7 | 12 | 1 |
| | C | 2 | 12 | 6 |
| Taste | 0 | 20 | 0 | |
| | A | 12 | 8 | - |
| | B | 6 | 13 | 1 |
| | C | 3 | 10 | 7 |

APPENDIX - XVII

ACCEPTABILITY SCORES OBTAINED FOR VADAI INCORPORATED WITH
10% DEFATTED SOYA FLOUR IN INDUSTRIAL CANTEEN I and II

CANTEEN - I

| Character | Number of consumers | | |
|------------|---------------------|------|------|
| | Very good | Good | Fair |
| Appearance | 200 | 245 | 5 |
| Colour | 441 | 9 | 0 |
| Texture | 440 | 10 | 0 |
| Flavour | 181 | 257 | 12 |
| Taste | 186 | 255 | 9 |

CANTEEN - II

| Character | Number of consumers | | |
|------------|---------------------|------|------|
| | Very good | Good | Fair |
| Appearance | 238 | 204 | 8 |
| Colour | 434 | 15 | 1 |
| Texture | 436 | 11 | 3 |
| Flavour | 210 | 228 | 12 |
| Taste | 224 | 214 | 12 |

APPENDIX - XVIII

ACCEPTABILITY SCORES OBTAINED FOR SAMBAR INCORPORATED WITH
10% DEFATTED SOYA FLOUR IN INDUSTRIAL CANTEEN I AND II

CANTEEN - I

| Character | Number of consumers | | |
|------------|---------------------|------|------|
| | Very good | Good | Fair |
| Appearance | 222 | 226 | 2 |
| Colour | 217 | 231 | 2 |
| Texture | 213 | 233 | 4 |
| Flavour | 249 | 198 | 3 |
| Taste | 259 | 188 | 3 |

CANTEEN - II

| Character | Number of consumers | | |
|------------|---------------------|------|------|
| | Very good | Good | Fair |
| Appearance | 160 | 279 | 11 |
| Colour | 174 | 266 | 10 |
| Texture | 178 | 259 | 13 |
| Flavour | 187 | 247 | 16 |
| Taste | 202 | 238 | 10 |

APPENDIX - XIX

ACCEPTABILITY SCORES OBTAINED FOR KOOTU INCORPORATED WITH
10% DEFATTED SOYA FLOUR IN INDUSTRIAL CANTEEN I AND II

CANTEEN - I

| Character | Number of consumers | | |
|------------|---------------------|------|------|
| | Very good | Good | Fair |
| Appearance | 212 | 233 | 5 |
| Colour | 210 | 234 | 6 |
| Texture | 216 | 228 | 6 |
| Flavour | 215 | 228 | 7 |
| Taste | 256 | 188 | 6 |

CANTEEN - II

| Character | Number of consumers | | |
|------------|---------------------|------|------|
| | Very good | Good | Fair |
| Appearance | 211 | 235 | 4 |
| Colour | 225 | 221 | 4 |
| Texture | 236 | 210 | 4 |
| Flavour | 241 | 205 | 4 |
| Taste | 249 | 197 | 4 |

APPENDIX-XX

STATISTICAL EVALUATION OF DATA

$$F = \frac{\text{Larger estimate of variance}}{\text{Smaller estimate of variance}}$$

$$V_1 = n_1 - 1 \text{ and } V_2 = n_2 - 1$$

V_1 = Degrees of freedom for sample having larger variance

V_2 = Degrees of freedom for sample having smaller variance