

Evaluation of Instant Mixes Based on
Defatted Soya Flour by Clientele of
Non-Commercial Food Services

BY

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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

APRIL 1994

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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.

CERTIFIED AS A BONAFIDE RESEARCH WORK


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THE GUIDE

ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

The investigator expresses her most reverential and sincere gratitude to Dr. (Tmt) **PADMASHRI RAJAMMAL, P.DEVADAS**, M.A., M.Sc., Ph.D.(Ohio State), D.Sc.(Madras), Vice Chancellor, Avinashilingam Institute for Home Science and Higher Education for Women (Deemed University), Coimbatore for providing an opportunity to undertake the study.

She extends her sincere thanks to **Dr.(Tmt)SAROJA PRABAKARAN**, M.A., Dip.in Ed.(Madras), Ph.D.(Mother Teresa) Registrar and to **Dr.(Tmt) LAKSHMI SANTA RAJAGOPAL**, M.S., (Tennessee) Ph.D.(Madras) Dean Faculty of Home Science Avinashilingam Institute for Home Science and Higher Education for Women (Deemed University), Coimbatore for all the amenities provided for the conduct of the study.

The investigator records her profound thanks to **(Tmt) K.S. SAROJINI**, M.Sc., M.Ed.(Madras) M.Phil(Bhartiar), Lecturer (Selection Grade) Department of Food Service Management and Dietetics, for her guidance and constructive suggestions rendered for the successful completion of the study.

The author is greatly obliged to Dr.(Tmt) PARVATHY EASWARAN, M.Sc., (Columbia), Ph.D.(Madras), Professor and Head of the Department of Food Service Management and Dietetics, Avinashilingam Institute for Home Science and Higher Education (Deemed University) Coimbatore for her concern, immense help and encouragement through out the study.

The author expresses her gratitude to Dr.(Tmt.) GODAVARI KAMALANATHAN, M.Sc., (Cornell), Ph.D.(Madras) Director, Avinashilingam Institute for Home Science and Higher Education (Deemed University).

The author expresses her heartfelt thanks to Mr.M.K.GOPINATHAN, M.A., D.Lit., Special Officer, Madras Advocate Co-operative Society canteen and to Mr. P.C. MOHAN the Manager, for his kind assistance.

The investigator is deeply indebted to her parents, husband, brother, sister, brother-in-law and friends for their constant encouragement and moral support in carrying out this study.

Last but not the least, author wishes to place on record her sincere thanks to all the clienteles and cooks of both the institution for their kind co-operation during the period of study.

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INTRODUCTION

I. INTRODUCTION

The Nutritional goal of any country would be to provide adequate nutrition and health support to its population so that they attain their full genetic potential growth and development (ICMR, 1990).

Good health is of paramount importance for every individual. The intake of appropriate and adequate food and their effective utilization by the human body is seen as the corner stone of human growth and development. (Grover et al., 1991) Man needs a wide range of nutrients to perform various functions in the body and to lead a healthy life. Nutrients are chemical substances which are present in the food we eat daily. These nutrients include protein, fat, carbohydrate, vitamins and minerals. (Gopalan et al., 1989).

Protein are vital to any living organism. Protein energy malnutrition is a leading killer and is the main nutritional problem in developing countries (Foster, 1992). It is the most prevalent and wide spread deficiency disease in India (John and Gopaldas, 1988).

Presently more than 15 million people die on global basis each year of starvation and malnutrition caused disease and three fourths of them are children (Gandhi, et al., 1987). Devadas et al., (1985) report that 0.2 to 5.5 per cent children suffer from severe forms of kwashiorkor and marasmus

Protein energy malnutrition accounts for high infant mortality rate of 95/1000 live births. This problem of malnutrition could be solved through the judicious use of inexpensive local foods (Gupta and Sehgal, 1991).

Legumes provide the necessary protein requirements, for people not capable of obtaining such from expensive animal protein sources like milk, meat, poultry and egg, so pulses are considered as poor man's meat (Laurena, et al., 1987).

Soyabean, a legume is progressively becoming a world wide potential source of major nutrients required for normal diet. As high as 45 per cent of the dry matter is protein and the amino acid pattern approaches the optimum recommended by FAO. Soyabean also contain about 20 per cent oil which is very desirable because it contains a large proportion of unsaturated fatty acid (Seralathan et al., 1989).

Among the cultivated crops of the World Soyabean occupies a place of pride because of its multifaceted uses as food, feeds and also for industrial utilisation. The two in one combination of high protein and oil is of particular importance to a country like India where we are deficient in both.

Soyabean occupies the first place in the World oil production. In India it has the third place in the oil seed and edible oil product. It is the lowest priced source of

high quality protein. The quality of soya protein is next only to animal protein and is much better than that of cereals and has a tremendous potential to meet protein calorie malnutrition. It is also a highly remunerative crop with less input demand. Although its economical viability was successfully demonstrated way back in the 60's the commercial exploitation of soyabean started only recently in India. It has now emerged as an important crop with a potential to narrow down the oil and protein gap (Neelam Kataria, 1991).

Most of the population in our country is unable to get enough of the right type of food to satisfy the protein calorie need. The result of a survey report title "Food and Nutrition status in India", studies cases from six different agro climatic conditions. This reveals that though the cereals consumed in rural area in India prove a satisfactory level of dietary energy in terms of calorie per capita per day, they lack in protein and vitamin. In view of the shortage in the production of milk and milk product, eggs and meat, their higher prices, the deficiency in the diet will have to be made up by inclusion of locally available low cost food of vegetable origin. Increase in the production level of protective foods for a balanced diet formula in rural areas will in the long run reduce demand for cereal foods of lower nutritive value. Soyabean a cheap proteinous food is one such example of low cost food of vegetable origin (Wanchoo, 1993).

Soya bean is fast emerging as India's most nutritional and inexpensive substitute for a variety of dairy products ranging from eggs and milk to cream nuggets and processed cheese. It is also entering the fast food industry as quick to cook supplements to wheat flour, meat base and assorted beverages (PTI Feature, 1992).

Soyabean often called as Miracle crop in US both for the farmers looking for good money and for consumers who buy vegetable protein in many of their present day food products. Considering the malnutrition in India especially among children soyabean can be more than a Miracle crop in India and the protein malnutrition could be effectively conquered if oilseed protein were used more efficiently (Pahwar, 1991).

A number of soya foods such as flours, oil, protein concentrates and isolates, various other fermented, coagulated products are available in the World Market (Gandhi and Ali 1987).

Weaning foods, biscuits, ice cream, beverages and sweets can be made cheaply from this vegetable protein. But people are not aware of various types of uses of soyabean (Pahwar, 1991).

In India many people are not aware of the soya foods except soya oil. In these days of energy crisis and uproaring food, prices, average income group families cannot

afford protein rich food of animal origin (Gandhi and Ali, 1987).

So there is a need to study the feasibility of introducing selected soya products by evaluating consumer acceptance. Hence the present study is carried out with the following objectives.

1. Introducing soya based recipes to the clientele of non-commercial food services.
2. Calculating the nutritive value of instant mixes.
3. Estimating the maximum percentage of acceptance of instant mixes with 10, 15 and 20 per cent of soya flour.

REVIEW OF LITERATURE

II. REVIEW OF LITERATURE

The literature pertaining to this study "EVALUATION OF INSTANT MIXES BASED ON DEFATTED SOYA FLOUR BY CLIENTELE OF NON-COMMERCIAL FOOD SERVICES" is reviewed under the following aspects.

- A. Nutritive value of soya
 - 1. Soya - as a protein supplement
- B. Food products of Soya
- C. Consumer acceptability of Soyabean
- D. Therapeutic use of soyabean

A. NUTRITIVE VALUE OF SOYA

Food legumes constitute an important part of the diet of a large section of the population in the developing world as a good source of ,protein carbohydrate, minerals and B-vitamins, (Gupta, 1987). Soyabean a legume is a two in one crop containing both protein and oil (Nanjayan, 1991).

Soyabean contains about 38-40 per cent very good quality protein, about 19-21 per cent fat of which about 17 per cent is composed of unsaturated fatty acids, 19 per cent holocellulose, 5 per cent oligosacclhrides, 5 per cent sucrose, trace amount of starch and glucose (Khare, et al., 1993).

Soyabean is a source of vitamin A, present in the form of precursor carotene and vitamin E is present to a level of 1.4 Mcg/g. Germination of soyabean brings a sufficient increase in concentration of B group vitamins and ascorbic acid (Singh, et al., 1989).

Soyabean is a rich source of fibre which is present in its hull. The hull is rich in holocellulose a major constituent of soya fibre and iron. The fibre being a poor source of phytic acid, dilutes the phytic acid concentration of food and helps in better absorption of minerals like iron, calcium magnesium and zinc which are vital for the body (Khare, et al., 1993).

Soyabean contains 70 mg of calcium per ounce and becomes a significant source when consumed in large amount (Guthrie, 1986).

Composition of amino acid of soya protein is close to that of FAO reference protein except for methionine and cystin. Use of soyabean in combination with cereals or pulses which are rich in the above two limiting amino acids of soyabean but lack lysine which is abundance in this bean, exerts synergetic effect and the quality of protein of both is greatly enhanced (Nirankar Nath, 1983).

In order to improve digestability of soyabean and remove the toxic trypsin inhibitor processes like soaking, steaming fermentation and germination have been used (Awasthi, 1989, Manorama and Sarojini, 1982).

Defatted soya flour contains 50 per cent protein unmatched by any other known vegetarian source (Brand and Lebel, 1988). It contains two times as much protein as dal, three times as much as eggs and 15 times as much milk and is the common form in which soyabean can be incorporated in various food preparations (Easter, 1991).

Soyabean can contribute not only a significant amount of protein at low cost but also the effective use of soyabean foods can go long way towards correction of dietary protein inadequacies since its protein is balanced in amino acid composition and compares well with animal protein (Mahajan, 1985).

TABLE - II

NUTRIENT COMPOSITION OF SOYA FLOUR*

Nutrient	Amount (PPM)
Chromium	0.32 - 0.59 PPM
Iron	67 - 81 PPM
Cobalt	0.244-0.358 PPM
Zinc	42 - 45 PPM

* Source: Jimbu and Ige, 1990.

TABLE - I
NUTRIENT COMPOSITION OF SOYABEAN, FULL FAT SOYA FLOUR AND
DEFATTED SOYA FLOUR*

Nutrient	Soyabean	Soyaflour full fat roasted	Soyaflour defatted
Moisture	8.1	3.8	7.52
Protein (N x 6.25) (g)	43.2	38.1	51.5
Lipid (g)	19.5	21.9	1.0
Carbohydrate (g)	20.9	30.4	33.9
Crude fiber (g)	3.7	2.2	4.3
Water (g)	-	3.8	7.3
Ash (g)	4.7	5.9	6.2
MINERALS			
Calcium Mg	240	188	241
Iron Mg	10.4	5.8	9.2
Magnesium Mg	238	369	290
Phosphorous Mg	690	476	674
Zinc Mg.	4.4	3.6	2.5
VITAMINS			
Thiamin Mg.	0.73	0.41	0.70
Riboflavin Mg	0.39	0.94	0.25
Niacin Mg.	3.2	3.29	2.61
Vitamin B-6 Mg.	-	0.35	0.57
Folacin Mg.	-	0.23	0.31

Amount : In 100 G.

Source : Erdman and Fordyce, (1989).

1. SOYA AS A PROTEIN SUPPLEMENT

Protein is one of the most important constituent in our body. It accounts for almost half the dry weight of body. High cost of protein rich foods and their availability are the two problems associated with lower intake of protein (Singh, 1992). Hence our people who are below the poverty line suffer from malnutrition and there by exposed to a number of diseases and ailments (Palaniyappan, 1983).

Protein deficiency is widely recognised to be the major cause of the high rates of morbidity and mortality of infants in the immediate post weaning period in most technically underdeveloped area (Nevin, et al., 1989).

Thomas Malthus speculated that the world would eventually starve because its population would increase faster than its food production. In some under developed countries this prediction has become reality. Agriculture and food technological achievements have been enormous but they are unable to keep up with the malnutrition and will continue to do so unless population growth is stabilized and

unconventional food sources as well as agricultural production are developed to the maximum (Graves and Peckham, 1987).

From the nutritional stand point, soyabean being an unconventional food contributes significantly supplementary and complementary protein as well as a source of calories and nitrogen (Boonyee, 1991).

Verma, et al., 1987 opine that the lower cost of soya protein when compared with milk, meat, and fish is the most favourable point in utilizing soyabean in human food preparation.

Studies conducted by the Indian Council of Medical Research indicates that PEM a debilitating nutritional problem among children, can be cured by a daily protein intake of 10 grams. "So with 40 per cent absorbable protein content, soyabean seems to be the right choice for school going children (Mehra, 1993).

When added to a cereal based food soya flour improves the amino acid balance, adding soya flour to gruels and

infant soup is one way to ensure a balanced diet in meals given to infants (Awasthi, 1990).

The prospect of using soyabean as a component of supplementary foods for infants and young children in Africa was found to be good (Igbedion, 1991).

Defatted soya flour was used to improve the nutritive value of a sweet bar used for supplementary feeding for under nourished school children in Ecuador (Ruales, et al., 1989).

The importance of soya protein over animal protein can be summed up as follows:

1. Soya protein is of high quality and is comparable to milk protein which is ideal and well balanced.
2. More protein can be obtained from per unit area.
3. Lower in cost than that of animal protein (Perumal et al., 1984).

B. FOOD PRODUCTS OF SOYA

During recent years a good deal of work has been carried out in different countries on the development of processed products based on soyabean for use as supplements in human diets (Swaminathan, 1985).

After the removal of the oil from the soyabean the remaining proteinaceous material is referred to as defatted flakes. Three basic soya protein products are derived from defatted flakes ranging in protein content namely soya flours, soya protein concentrate and soya protein isolates (Sipos 1990).

Soya flour has excellent nutritional and functional qualities for food applications and is used in many food products. Soya flour are available in following forms, defatted flour containing less than 1 per cent fat, full fat soya flour with a minimum of 18 per cent fat, low fat flour containing fat usually in the range of 4.5 to 9 per cent fat, lecithinated soya flour and enzyme activated soya flour (Calanderes 1987).

Soya protein concentrates have provided the base for a second generation of textured proteins. Textured soy concentrates contains 70 per cent protein in dry solid basis and have excellent textural and water binding properties. Isolated soy proteins contain a minimum of 90 per cent

protein on a dry - solid basis and are produced in many forms. Functional soya concentrates are bland in flavour and exhibit functional properties revealing those of isolated proteins (Cunningham et al., 1990).

Spun fibres with 95 to 98 per cent protein is made from the soya protein isolate which is dissolved in alkaline substance then spun into threads. (Wenck et al., 1983).

Soyabean is being popularised as soya milk and other dairy analogues such as tofu, soya yoghurt soya candy and soya ice creams etc. Soya milk contains more than 5 per cent protein which is comparable to cow's milk (4 per cent). (Pushpendra et al., 1992).

Tofu or bean curd was invented by a Chinese Scholar in 164 BC and is the most important of the foods prepared from soyabean in the East. It is made by coagulating soya milk with calcium sulphate. It may be frozen aged, thawed and finally squeezed to give dried tofu which has a longer shelf life than fresh tofu. Tofu is white in colour and bland in taste but readily picks up other flavour. (Drumond, 1989).

Sufu is made by inoculating sterilized tofu with a fungus. A Japanese food called Hamantto is made by fermenting cooked whole soyabean mixed with parched wheat

flour. The fermented soya are then mixed with salt, spice, water, wine and then aged. When the whole bean is fermented with a different yeast the final product is called Natto (Natarajan, 1985).

Miso is a mixture of soyabean flour and rice flour which is made into a paste using water and inoculated with fermented rice (Koji) and fermented for 3 to 4 days (Swaminathan, 1985).

Okara is an insoluble by product of soya milk. Fermented okara is rich in hemicellulose and low in lignin and phytic acid content. (Guerman et al., 1993).

Saridele is a dried soyabean milk powder and are being advocated as potential sources of calcium and protein (Guthrie, 1986). An Indonesian food called Tempeh is prepared from soaked, cooked and drained soyabean that are then fermented. (Graves and Peckham, 1987).

Soyabeans are the major commercial source of lecithin and contain 0.3 - 0.6 per cent phosphatides. Lecithin as separated from soyabean oil is known as crude lecithin or commodity grade lecithin (Calandres, 1987).

C. CONSUMER ACCEPTABILITY OF SOYABEAN

The aroma and sight of food probably contribute to food acceptability and to human judgement of food quality (Piggot 1985). Quality is the totality of features and characteristics of a product or services that bear on its ability to satisfy stated or implied need (Crosby, 1992).

A large number of acceptability studies have been conducted on soya products by nutritionists all over the World (World Health, 1983).

The highest domestic consumption is in Asia where it has been basic food for decades (Sharma, 1986).

Its production and utilization both at house hold level and industrially is gradually increased in countries such as Nigeria, Egypt, Zaire and Camuon (Igbedioh, 1991). Increased production and utilization of soyabean in Pakistan as low cost protein source is gaining importance (Sattar et al., 1990).

Soyabean the poor man's source of energy rich nutrient with a long shelf life remained on the shelf (Charulatha, 1993). Because it has some unacceptable qualities such as extraordinary beany flavour, antinutritional factors and poor cooking quality (Patil and Ali, 1989).

Therefore soyabean was not relished and accepted by people in our country. This draw back can be overcome by

blending the soya flour to a certain extent with cereals or millet flours (Jayalakshmi and Neelakanthan, 1987).

Technological advances leading to the development of large variety of new soya products, incorporating the use of soyabean derivatives have resulted in increase soya consumption in other regions of the world (Boonyee, 1991).

The demand for soya products is consistently increasing in India and other III World countries as they have a great potential in solving the food shortages created by ever expanding population (Gandhi et al., 1985).

The increased acceptance of soya protein is also due to qualities which are unmatched, good functional properties in food applications, and high nutritional quality, abundance availability and low cost (Sipos, 1990).

Defatted soya flour is a common form in which soyabean can be incorporated in various food preparations. It has been shown to be freely acceptable when incorporated in food formulation (Tandon and Singh, 1987).

It would be perhaps easier to supplement already existing and accepted food products like bread and other baked products by soya flour. This approach can lead to balanced food intake of nutritionally sound food material by the population (Kulkarni, 1991).

Studies carried out at CFTRI on high protein bread formulation showed that acceptable bread could be prepared from maida fortified with defatted soya flour upto 12 per cent level (CFTRI, 1983).

Adding soya flour to wheat flour for chappaties and producing soya biscuits are potentially easier ways of making the product more acceptable (Singh, 1993).

The chappathi prepared from dough of wheat defatted soya flour (10%) blends was evaluated for sensory properties and showed complete inactivation of trypsin inhibitor activity and was well acceptable (Chauhan and Kumari, 1992).

Soya flour is also ideal for making snack or fast food more so as a substitute for besan and urud flour. In preparation of noodels, meat analogues, liquid food and candies soya flour can constitute upto 50 per cent of the ingredients used by weight (PTI Feature, 1992).

The effect of addition of defatted soya flour 5 - 23 per cent on physio chemical characteristic and acceptability of green gram barian was investigated. There was increase in the level of protein, ash in the product and it was also well accepted but the visual colour of barian became darker with increase in the addition of soya flour (Tandon and Singh, 1987).

The effect of addition of soya flour 10 to 70 per cent to black gram pappad showed no change in the dough texture though the rolling property was affected. There was no significant difference in physical and sensory characteristics of the papad with the addition of 30-40 per cent soya flour (Deepa et al., 1992).

Previously it was not possible to replace pulses by soyabean as dal because of its poor cookability and undesirable taste. But treatment of soyabean for improving its cookability and rendering it free from the beany flavour and considerable taste has made it possible to utilise it as dal and may thus help in improving the quality of diet (Sinha, 1984).

South Indian recipes with soyabean like soya milk, vadai, were prepared with whole soyabean. Soya milk was found to be acceptable further 50 per cent substitution of soyabean in the place of bengal gram dhal was found to be highly acceptable in the case of vadai. Products like sundal, seasoned dhal, fried dhal, payasam prepared with soya dhal were found to be acceptable with 100 per cent substitution (Seralathan et al., 1987).

Good acceptable dosa could be prepared by complete replacement of black gram dhal by soya dhal using rice and soya in the proportion of 4:1, ferment should be restricted

to 10-12 hours to get desired flavour, acidity and good texture (Rao and Subramaniam, 1985).

Beverage are the most exciting soya products, soya milk is a popular drink through out South East Asia. In Hongkong it is called Vitasoy in Singapore Vega Milk (Pahwar, 1991). According to Mahatma Gandhi soya milk can also be called as an 'Ahimsa Milk' (Mahalingam 1984).

Soya maize banana product with soya milk showed good acceptability (Adeymi et al., 1992). Panneer prepared by blending 10 per cent and 20 per cent of soya milk with buffalo milk was well accepted (Babje et al., 1992).

Soya ragi multimix was nutritious and was used as a pre-school children snack remedial and preventive measure against protein energy malnutrition. This mix also met one fifth of RDA's of the pre-school child (Vijayalakshmi and Sujatha, 1989).

Sensory evaluation of two products noodles and bread prepared by using soya flour as an ingredient revealed that both products were well accepted (Jasser, 1986).

Sorghum vermicelli prepared by incorporation of soya flour from 10-30 per cent level produced product acceptable in taste, flavour, colour and feature as assessed by trained panelists using seven point hedonic scales (Swaraj, 1989).

D. THERAPEUTIC USE OF SOYABEAN

The high protein content and high yielding capacity of soya has proved fruitful in healing several diseases by offering positive nutritional and health benefits as well as improved general body mechanisms at a cheap economic rate for both vegetarian and non vegetarian people (Manickam, 1992).

Supplementation of soya foods in human diet has proved beneficial in many disease condition viz PEM, gall stones, chronic hepatitis, gastric ulcers, hyperlipidemia, hypercholesteremia, gout, rheumatism, breast and colon cancer and inborn metabolic disorders like lactase deficiency and diabetes mellitus (Vaidehi et al., 1985, Judy Ria, 1989).

Soya milk rich in proteins and vitamin B, and devoid of lactase was acceptable by children. The symptoms of diarrhea and vomiting stopped in 4 to 8 days. There was decrease in stool volume with reduced frequency. There was quick increase in body weight and mental alertness reduction in edema was seen at the end of 2 days. Soya milk is suitable for people having lactose intolerance and about 60 per cent of Indian population suffer from lactose intolerance (Bhutta et al., 1992, Awasthi, 1990).

Soyabean is a mean to combat nutritional anaemia and plays an effective role in preventing anaemia in expectant

mothers and nursing mothers. This high fibre product also alleviates early pregnancy problem like nausea and constipation (Saraswat, 1993).

As soyabean contains an abundance of phosphate it can be used with advantage in the cure of nervous diseases. Some medical authorities have used in the treatment of rickets, pulmonary diseases and anaemia (Kale, 1985).

As soyabean have less starch and more protein they are preferred by overweight people. (Dermott et al., 1987). Jenkins et al., (1990) carried out a study in which obese persons took part for 12 weeks. During 8 weeks 2 meals of their control (1000 K.Cal) was replaced by soya based liquid formula and the mean weight loss per month was 2.5 kg.

Diabetes is the fifth major disease in India and about 3 per cent population suffers from this disease. Low carbohydrate, high protein and low fat diet is prescribed for the control of diabetes. So soyabean containing 40 per cent of good quality protein, 12 per cent carbohydrate, mineral and vitamin is one of the most suitable food ingredient for diabetics (Gandhi, 1992).

In a study conducted by Naganwa et al., 1991 it was found that soya protein can be given to patients with cirrhosis in order to prevent protein calorie malnutrition.

In a study conducted by Komatsu and Ymagishi (1991) of 4 patients studied 2 had hypoproteinaemia due to protein loosing gastroenteropathy and other 2 due to nephrotic syndrome. All the 4 patients were given jelly containing 10 g soya peptide (SPT) for 20 weeks and 20g SPT for 10 weeks respectively. Intake of SPT improved the hypoproteinaemia of the two protein loosing patients. Nitrogen balance of the nephrotic patients was negative before SPT supplementation but became positive when SPT was given.

Recently attention has been focused on soyabean consumption in reducing cancer risks. It contains high concentrations, of several compounds with demonstrated anticarcinogenic activity (Boonyee, 1991).

Soyabean protease inhibitors can inhibit or prevent development of experimentally induced colon, oral, lung, liver and oesophageal cancers. Protease inhibitors are unique in their irreversible suppressive effect on the carcinogenic process. (Barnes and Messina, 1991).

Naturally occurring compound in soyabean called genisten block cancer causing genes and it is found in all soyabean products (Lowellponte, 1993).

According to microbiologist Michael Pariza (1992) the principal flavour component of traditional (fermented) soya

sauce contains a substance called HEMF (4-Hydroxy - 2 (or 5) Ethyl - 5 (or 2) - Methyl - 3 (2H) furanone) which is one of the more powerful anticancer agents and was particularly effective in quantities as small as 4 m.gms/kg. of body weight.

In premenopausal women a high intake of animal protein was associated with increased risk of breast cancer. Decreased risk was associated with a high intake of soya protein. (Lee et al., 1991).

Increased serum lipid level is one of the most important risk factors for the development of atherosclerotic cardio vascular disease (Vessby 1989).

Hypercholesterolemia a major risk factor in atherosclerosis, especially in the coronary arteries. Diet treatment from a population stand point remains the cornerstone of the treatment. In order to lower cholesterolemia the intake of total lipids and cholesterol must be lowered and the consumption of polyunsaturated or monosaturated fatty acids must be increased (Ziegler et al., 1991).

Soyabean protein has hypocholesterolamic and anti atherogenic property (Boonyee, 1991).

When compared with casein, soya protein decreases the absorption of intestinal cholesterol and reduces the reabsorption of bile acids. These effects are the key to the hypercholesterolemic patients action of soya protein. In hypercholesterolemic patients lowering of serum total cholesterol by upto 20 per cent occurs after the transfer from a mixed protein diet to a diet containing predominantly soya protein. (Beyen, 1993).

Wolfe and Grace, (1986) reported that the substitution of soya protein for meat and dairy protein resulted in substantial lowering of mean serum cholesterol in healthy adults of both sexes.

Van Raaij et al., 1981 reported that substitution of 65 per cent soya protein for casein in diet containing 13 per cent of total calories from protein resulted in a marked decline in LDL cholesterol and a weaker but still significant increase in HDL cholesterol.

In a study conducted by Lavin et al., 1992 the results indicated that administration of soya protein may induce clinically beneficial effects in children with familial hypercholesterolemia.

Soya bean are excellent source of unsaturated fatty acids. A number of recent reports indicated that dietary

omega 3 fatty acid have a beneficant effect on cardiovascular disease. Raw soyabean oil contains an average of 7.8 per cent naturally occuring omega 3 in the form of alfalinolenic acid content in soyabean (Pushpendra et al., 1992).

The linoleic acid content of diet has been correlated with lower cholesterol level in the body. Because of these attributes consumption of soyabean oil is considered desirable in view of increased incidences of cardiovascular ailments (Ramakrishna et al., 1990).

Regular use of soyabean oil (1 table spoon a day) has also been known to cure chronic constipation and lecithin present in soya oil is useful for proper functioning of brain (Awasthi 1990).

EXPERIMENTAL PROCEDURE

III. EXPERIMENTAL PROCEDURE

The experimental procedure pertaining to the study "EVALUATION OF INSTANT MIXES BASED ON DEFATTED SOYA FLOUR BY CLIENTELE OF NON-COMMERCIAL FOOD SERVICES" consisted of the following aspects.

- A. Selection of the non-commercial food service institution.
- B. Introduction of instant mixes based on defatted soya flour.
- C. Calculation of the nutritive value of the standard and soya flour incorporated instant mixes.
- D. Conducting acceptability test
 - 1. Formulation of the score card
 - 2. Conducting acceptability trials.

A. SELECTION OF NON-COMMERCIAL FOOD SERVICE INSTITUTION

The non-commercial food service or institutional food service, consists of business educational, government and insitutional organizations that operate their own food service. Food service is provided as an auxillary service to complement other activities and is served primarily as a convenience for employers, students, patients or residents. Most of these institutions are run on a non-profit basis (Khan, 1987).

Two non-commercial food service institutions were selected for the study. Criteria for the selection of food service institutions was based on convenience sampling. The two institutions were 'The Madras Advocates Co-operative Society Canteen'(I₁), situated in the High Court Campus - Madras and the 'Saradalaya Canteen'(I₂), located in the Collectorate Campus - Coimbatore. The cooks in both the canteens were given instructions about the preparation of recipes with the instant mixes based on defatted soya flour.

B. INTRODUCTION OF INSTANT MIXES BASED ON DEFATTED SOYA FLOUR

Formula for the instant mixes were adopted from "Formulation and evaluation of instant mixes based on defatted soya flour", an unpublished research study conducted in our institution in the year 1993. In the previous study the instant mixes were developed for 2 savouries namely bajji and pakoda and 2 sweets namely halwa and gulabjamun. For the present study these instant mixes were introduced in the selected non-commercial food service.

C. CALCULATION OF NUTRITIVE VALUE OF THE STANDARD AND SOYA FLOUR INCORPORATED INSTANT MIXES

Nutritive value of the recipes prepared with standard mix and instant mixes were calculated using the food

composition tables of Gopalan et al., 1989. Energy, protein, fat and fibre content of the recipes were calculated.

D. CONDUCTING ACCEPTABILITY TEST

Watts et al., (1989) is of the view that acceptance tests are done to determine the degree of consumer acceptability for the product and consumer panelists are not trained, or chosen for their sensory acuity but are the users of the product.

The following steps were involved in evaluating the acceptability.

1. Formulation of the score card
2. Conducting acceptability trials

1. Formulation of the Score Card:

Sensory evaluation of recipes forms a crucial part in culinary art. Sensory indices are colour, flavour, texture and taste which forms an integral part of the food as it stimulates the appetite, enhances delight and leaves a feeling of satiety aiding in better digestion. Unless this is not satisfied the recipe or the food is said to be incomplete (Singh and Gupta, 1984).

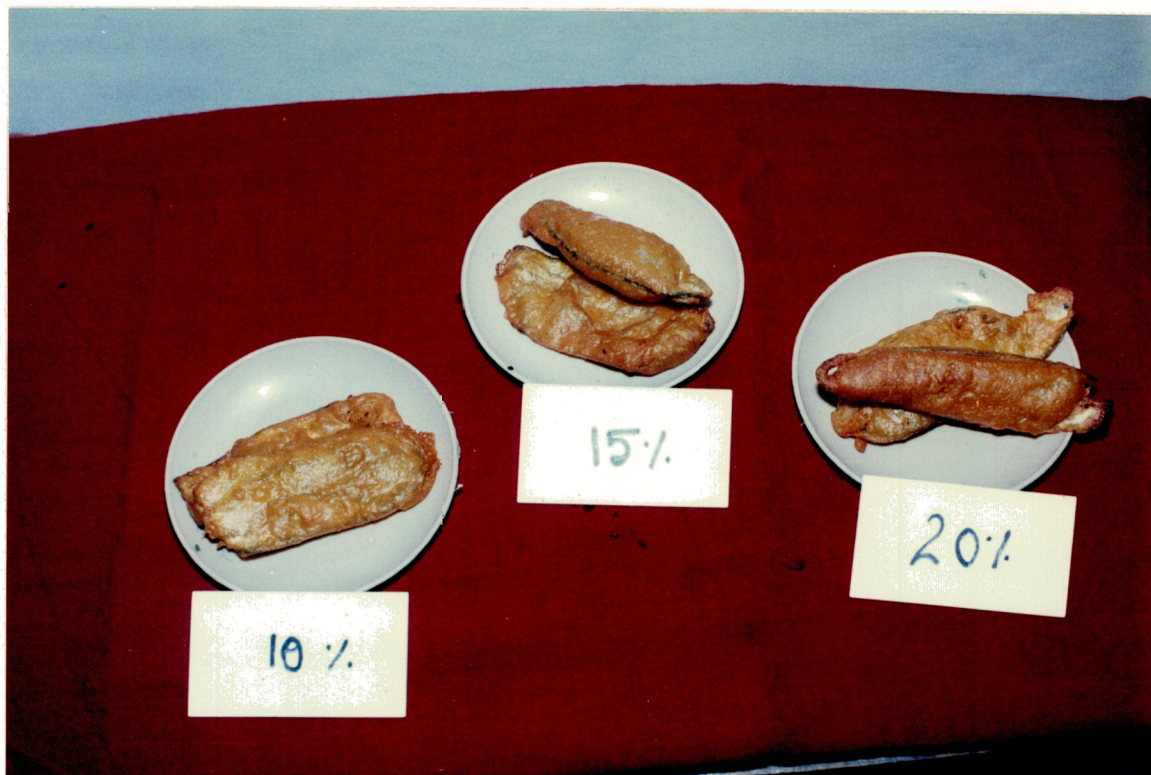
So the sensory indices colour, flavour, texture and taste were evaluated for the recipes prepared from the instant mixes using three point scale score card. The individual score card are given in appendix II, a, b, c, d.

2. Conducting Acceptability Trials:

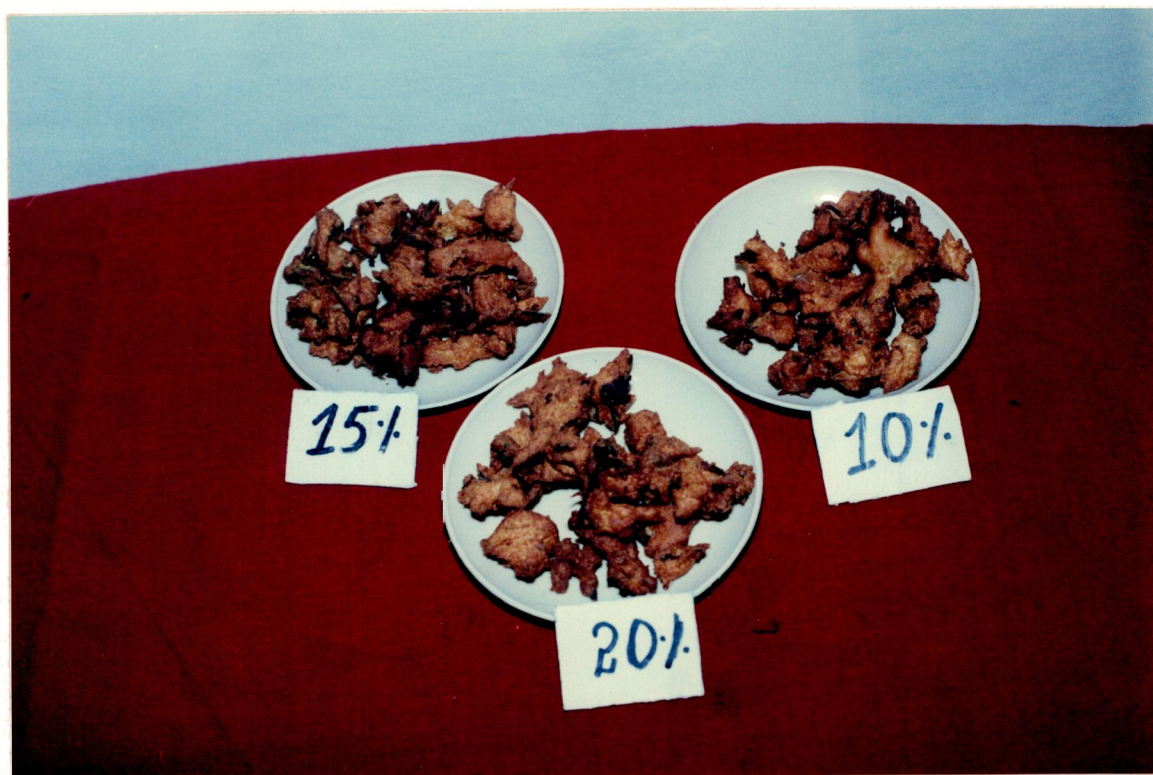
The recipes prepared with instant mixes were served to the clientele of non-commercial food services. Acceptability trial for the recipes were conducted thrice and the mean scores for each quality was calculated. The individual recipes are given in the Appendix and Plate I, a, b, c, d.

PLATE - I

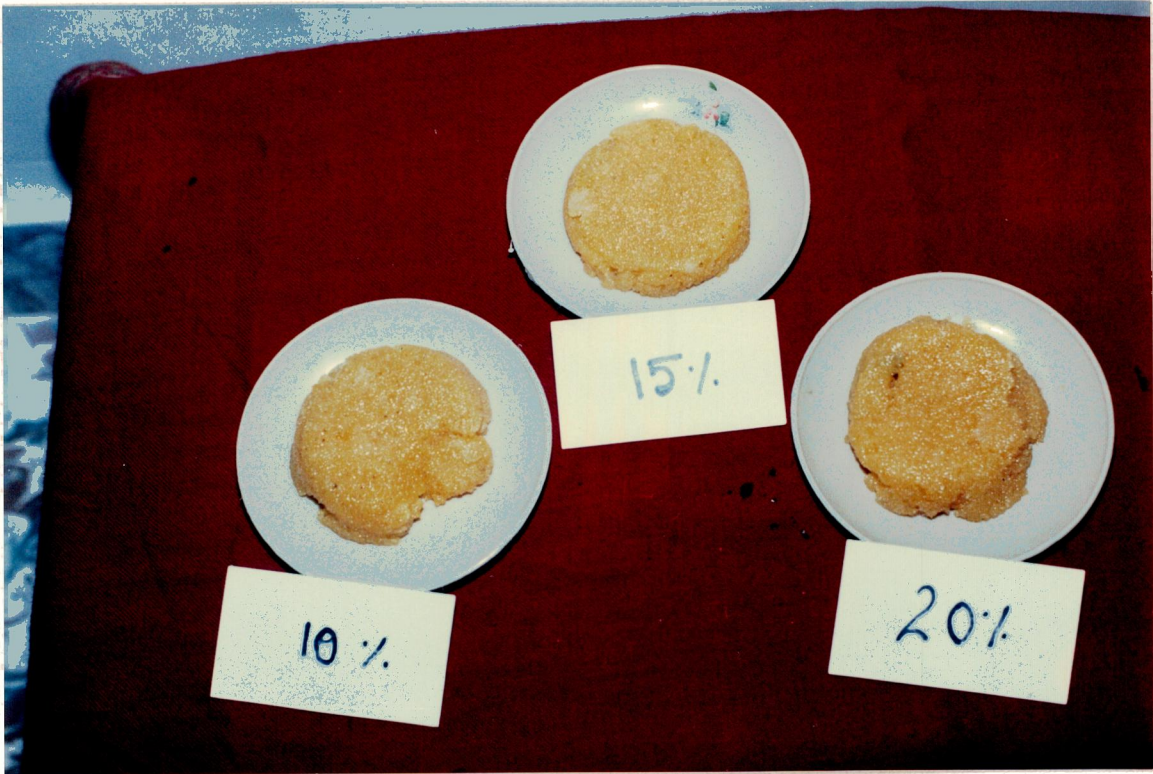
RECIPES PREPARED FROM INSTANT MIXES



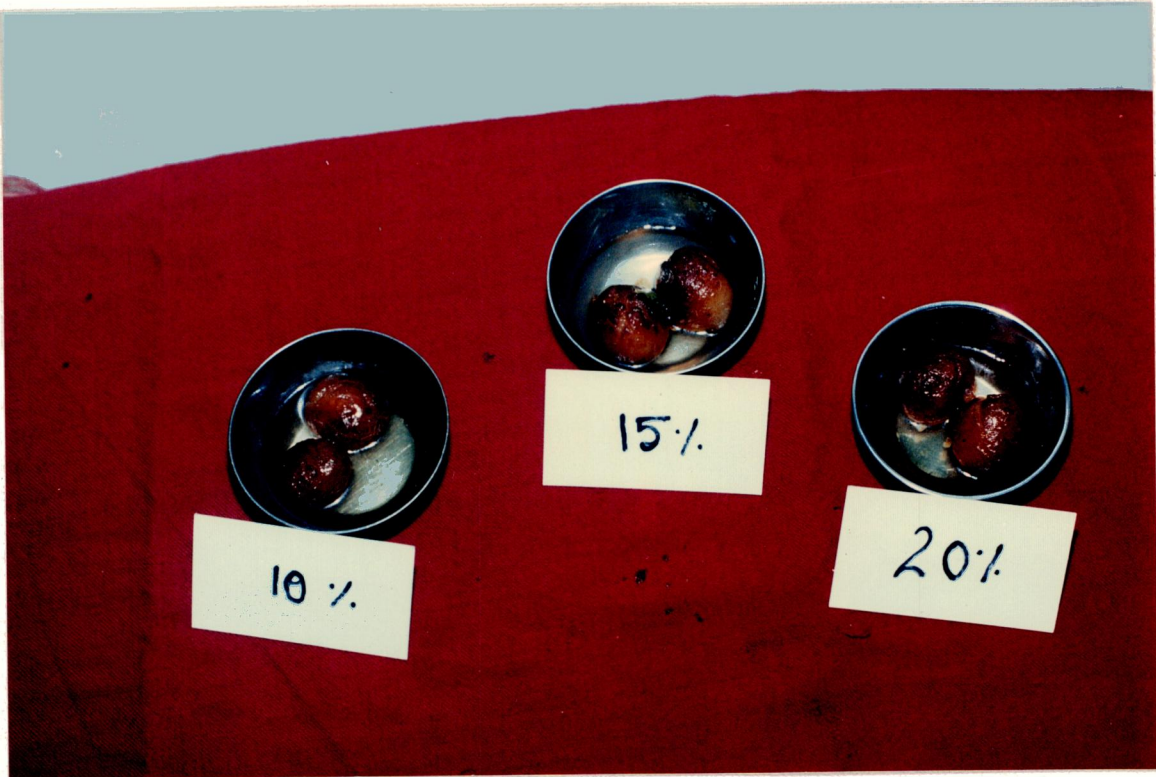
A. BAJJI



B. PAKODA



C. HALWA



D. GULAB JAMUN

RESULTS AND DISCUSSION

IV. RESULTS AND DISCUSSION

The results obtained in the present study "EVALUATION OF INSTANT MIXES BASED ON DEFATTED SOYA FLOUR BY CLIENTELE OF NON-COMMERCIAL FOOD SERVICES", are discussed under the following headings.

- A. Nutrient content of the instant mixes.
- B. Clientele acceptability of the recipes prepared from the soya incorporated instant mixes in the two selected non-commercial food service institution.
 - 1. Mean acceptability scores obtained for
 - a. Bajji
 - b. Pakoda
 - c. Halwa
 - d. Gulabjamun
- C. Mean acceptability scores obtained for all the four recipes prepared with soya flour incorporated instant mixes.

A. NUTRIENT CONTENT OF INSTANT MIXES

Tables III, IV, V and VI gives the nutrient content of the standard and the instant mixes based on defatted soya flour. The composition of instant mixes are presented in the appendix III a,b,c,d and illustrations are given in figures 1, 2, 3, and 4.

TABLE III
NUTRIENT CONTENT OF BAJJI MIX

S.No.	Nutrients	Standard	Percentage Incorporation of soya flour		
			10	15	20
1.	Energy (K.Cal)	387	387	384	383
2.	Protein (g)	18.5	20.8	21.96	23.1
3.	Fat (g)	5.17	4.82	4.65	4.48
4.	Fibre (g)	2.99	3.43	3.95	4.29

Table III depicts the nutrient content of bajji mix. As the percentage incorporation of defatted soya flour increased a decrease in fat content when compared to standard was noted. The decrease in fat content was due to defatted soya flour as it contains less than one gram of fat per 100 gm. There was reduction in the energy content of soya incorporated bajji mixes when compared to standard which was due to the reduction of fat content. Soya being a rich source of protein, increase in percentage incorporation of soya resulted in increased protein content of the mix when compared to the standard. Similar results of increase was noted for fibre also.

Figure - 1
ENERGY CONTENT OF BAJJI AND
PAKODA MIX

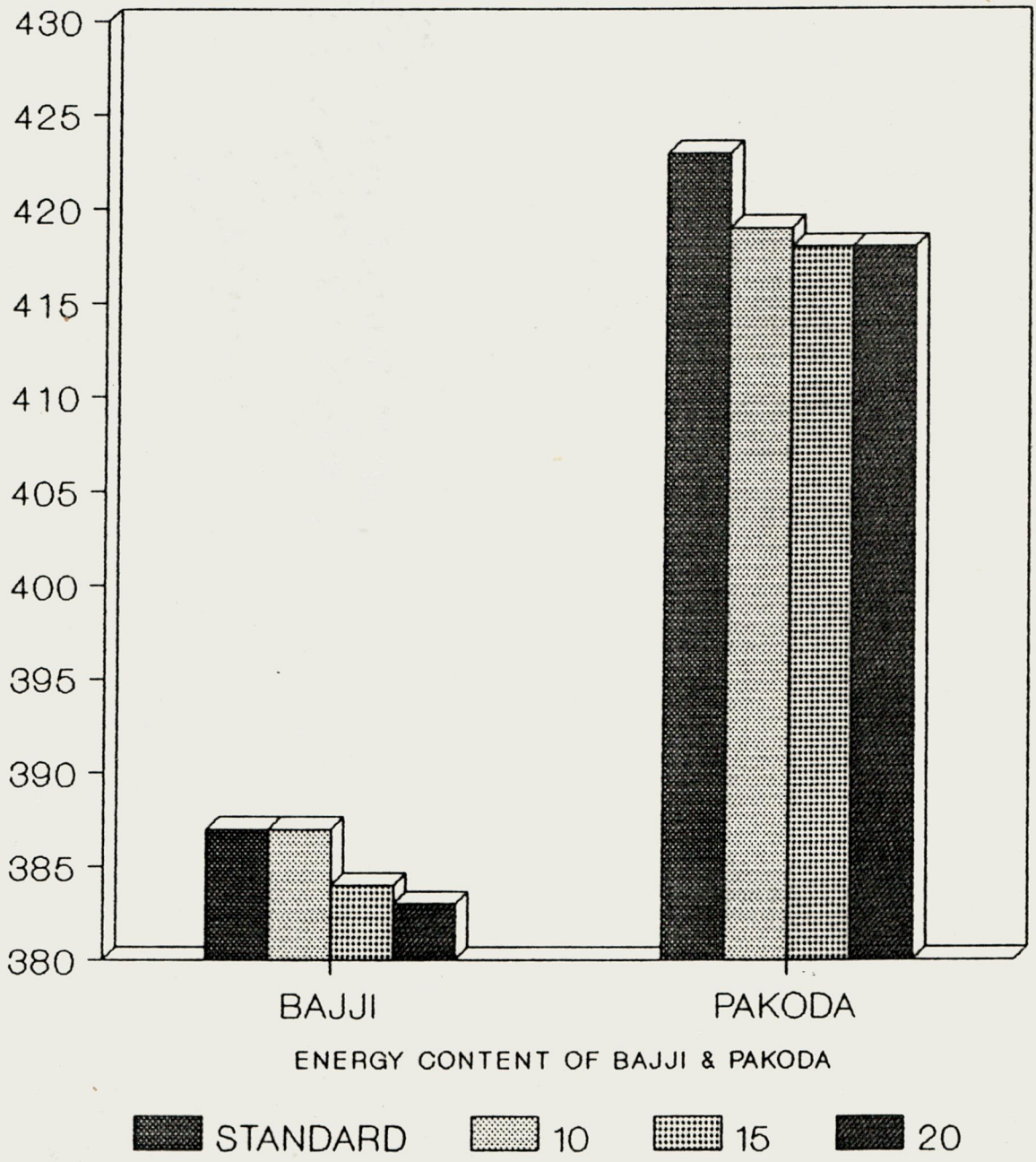


Figure - II
 PROTEIN, FAT AND FIBRE CONTENT OF
 BAJJI AND PAKODA MIX

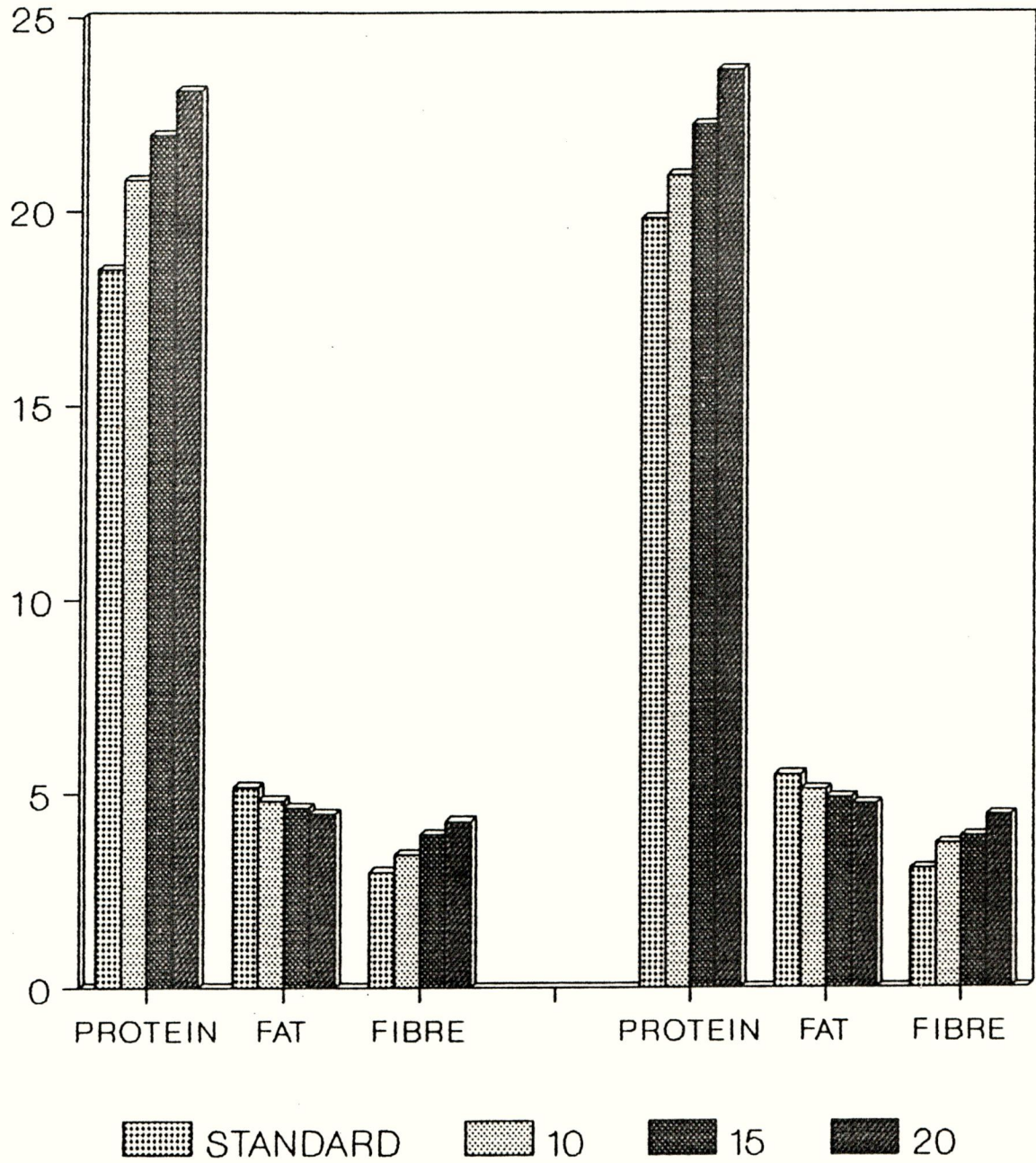


TABLE IV
NUTRIENT CONTENT OF PAKODA MIX

S.No.	Nutrients	Standard	Percentage Incorporation of soya flour		
			10	15	20
1.	Energy (K.Cal)	423	419	418	418
2.	Protein (g)	19.8	20.92	22.22	23.62
3.	Fat (g)	5.48	5.10	4.9	4.73
4.	Fibre (g)	3.06	3.70	3.89	4.44

Table IV depicts the nutrient content of pakoda mix, appraisal of the above Table depicts that standard pakoda mix contributed a maximum of 423 K.cal of energy when compared with the other standard instant mixes. The protein content of standard pakoda mix 19.8 g was more when compared to the standard bajji, halwa and gulabjamun mix. There was decrease in the energy content of soya incorporated mixes when compared to the standard. Decrease in fat content was also seen in soya incorporated instant mixes when compared to the standard because defatted soya flour was used. There was increase in protein and fibre content of the soya incorporated mixes as soya is a rich source of protein, fibre and the protein content increased as the percentage of incorporation increased.

TABLE V
NUTRIENT CONTENT OF HALWA MIX

S.No.	Nutrients	Standard	Percentage Incorporation of soya flour		
			10	15	20
1.	Energy (K.Cal)	355	355	355	355
2.	Protein (g)	13.41	17.1	18.95	20.8
3.	Fat (g)	0.78	0.71	0.80	0.81
4.	Fibre (g)	0.68	1.55	1.98	2.42

Table V portrays nutrient content of halwa mix. Energy content of soya incorporated instant mix was same as the standard. The defatted soya flour contributed more fat to halwa mix when compared to the standard. The protein content of halwa mix reached a value higher than the standard mix when soya was incorporated. With increase in percentage of incorporation of soya flour the fibre content also increased.

TABLE VI
NUTRIENT CONTENT OF GULABJAMUN MIX

S.No.	Nutrients	Standard	Percentage Incorporation of soya flour		
			10	15	20
1.	Energy (K.Cal)	356	356	356	356
2.	Protein (g)	18	21.05	22.55	24.07
3.	Fat (g)	0.74	0.74	0.74	0.74
4.	Fibre (g)	0.68	1.43	1.78	2.15

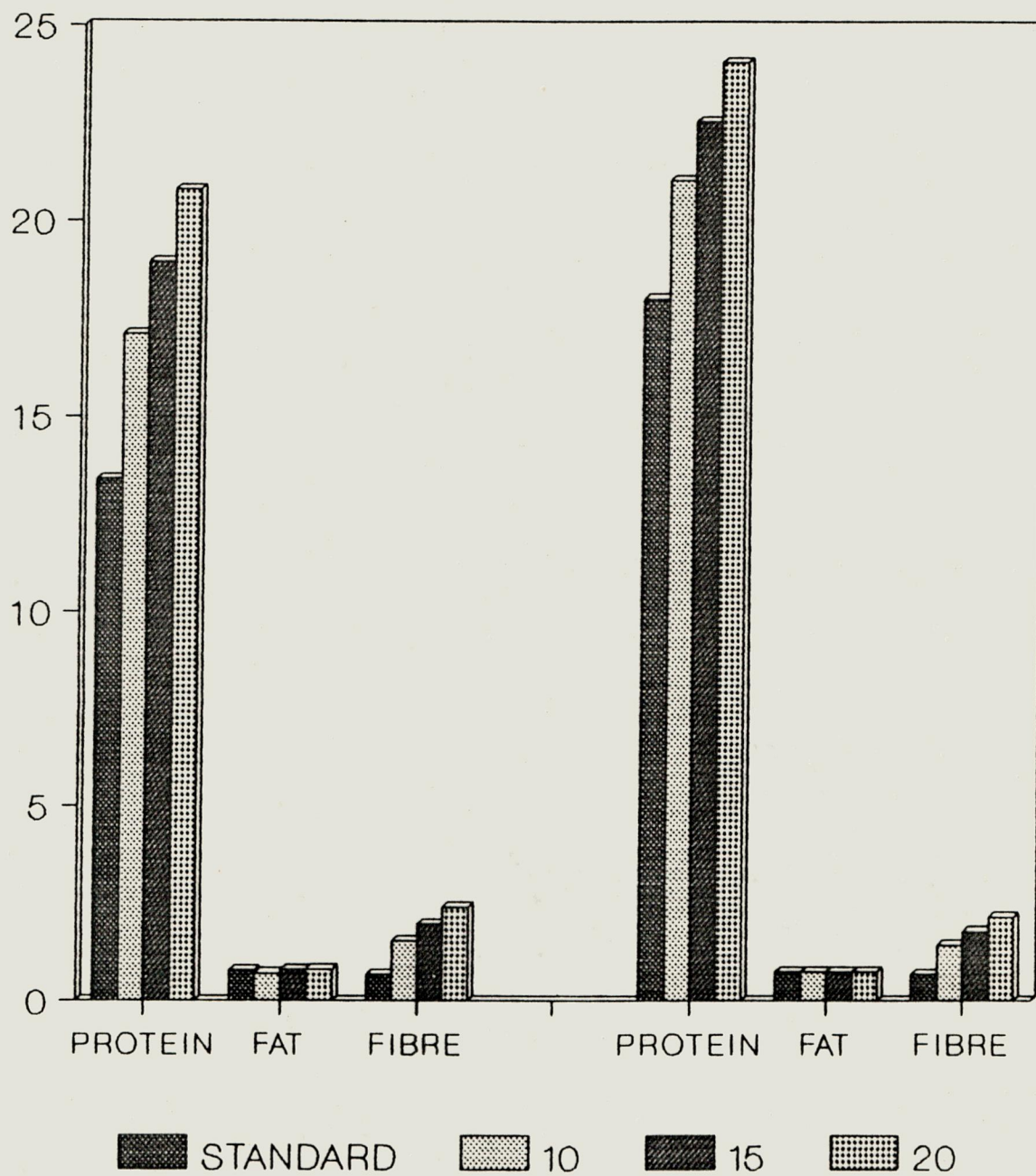
Table VI depicted no changes in the energy and fat content of soya incorporated instant mixes when compared to the standard mix. Since defatted soya flour is a rich source of protein and fibre, the protein and fibre content increased as the levels of incorporation of soya flour increased when compared to the standard.

Analysis of the above Table III, IV, V and VI showed that among the soya flour incorporated mixes the bajji mix with 20 per cent soya flour had maximum content of fat 4.48 g and gulabjamun mix with 20 per cent incorporation of soya flour had maximum content of protein 24.07g.

Figure - III
ENERGY CONTENT OF HALWA AND
GULABJAMUN MIX



Figure - IV
PROTEIN, FAT AND FIBRE CONTENT OF
HALWA AND GULABJAMUN MIX



B. CLIENTELE ACCEPTABILITY OF THE RECIPES PREPARED FROM THE SOYA INCORPORATED INSTANT MIXES IN THE TWO SELECTED NON COMMERCIAL FOOD SERVICE INSTITUTIONS.

Watts et al., 1989 opines that when a new food product is developed or an already existing food product is reformulated, the changes caused by processing methods, storage or by the use of new ingredients and the maintenance of quality should be identified and sensory properties must be measured and for this reason the acceptability trials are carried out.

The savoury and sweet items prepared from the instant mixes based on defatted soya flour were subjected to acceptability tests. The clientele of the two selected non commercial food service institution formed the panel members. The venue of the acceptability test being 'The Madras Advocates Co-operative society canteen I₁, and 'Saradalaya Canteen' in the collectorate campus Coimbatore-I₂.

1. MEAN ACCEPTABILITY SCORES FOR

a. Bajji:

The acceptability scores for bajji mix with 10, 15 and 20 per cent soya flour incorporation are given in tables VII, VIII, IX, X and illustrated in figure V.

TABLE - VII
MEAN ACCEPTABILITY SCORES FOR BAJJI MIX WITH 10 PER CENT
SOYA FLOUR INCORPORATION

N = 87

CHARACTERISTICS	A*		B*		C*	
	I ₁	I ₂	I ₁	I ₂	I ₁	I ₂
Colour	120	165	48	27	5	-
Flavour	215	160	6	30	-	-
Texture	210	155	9	33	-	-
Taste	220	160	3	30	-	-

*A - good *B - Fair *C - Poor

Table VII depicts the mean acceptability scores for bajji mix with 10 per cent soya flour incorporation in the two institutions. The colour was rated good and obtained a score of 120 in I₁ while it obtained 165 in I₂. Clienteles from I₁, graded quality of colour fair by giving a score of 48 while it was scored 27 in I₂ and the poorest quality obtained a score of 5 in I₁, while none in I₂ scored it as poor. The olfactory (flavour) score of the product was rated good by scoring 215 in I₁ and 160 in I₂ while it was rated fair by obtaining a score of 6 in I₁, and 30 in I₂. The texture was rated good by obtaining a score of 210 in I₁, and 155 in I₂ while it was regarded fair by receiving a score of 9 in I₁, and 33 in I₂. A score of 220 was obtained for the good taste in I₁, while a score of 160 was obtained in I₂ and it was graded fair by receiving a score of 3 in I₁, while 30 in I₂. Taste was not disregarded in either of the institutions.

TABLE- VIII
MEAN ACCEPTABILITY SCORES FOR BAJJI MIX WITH 15 PER CENT
SOYA FLOUR INCORPORATION

CHARACTERISTICS	N = 87					
	A*		B*		C*	
	I ₁	I ₂	I ₁	I ₂	I ₁	I ₂
Colour	170	155	39	27	-	-
Flavour	210	155	15	24	-	1
Texture	205	135	18	39	-	-
Taste	205	120	18	45	-	1

* A - GOOD *B - FAIR *C - FAIR

Table VIII depicts the mean acceptability scores for bajji mix with 15 per cent soya flour incorporation. The colour was ranked good and obtained a score of 170 in I₁, while it obtained 155 scores in I₂. Scorers felt colour as fair by giving a score of 39 in I₁, and 27 in I₂. The flavour was hailed good by obtaining a score of 210 in I₁, and 155 in I₂ while it was deemed fair when it received a score of 15 in I₁, and 24 in I₂ and was disregarded by receiving a score of I₁. The texture was rated good by obtaining a score of 205 in I₁, and 135 in I₂ while it was regarded fair by receiving a scored of 18 in I₁, and 39 in I₂. The taste was rated good by obtaining a score of 205 in I₁, and 120 in I₂ while it score 18 in I₁, 45 in I₂ for the attribute fair and it was considered poor by receiving a score of 1 in I₂.

TABLE - IX
MEAN ACCEPTABILITY SCORES FOR BAJJI MIX WITH 20 PER CENT
SOYA FLOUR INCORPORATION

CHARACTERISTICS	N=91					
	A*		B*		C*	
	I ₁	I ₂	I ₁	I ₂	I ₁	I ₂
Colour	175	180	39	21	-	-
Flavour	130	120	66	54	-	1
Texture	170	110	42	63	-	-
Taste	195	130	57	42	-	3

* A - GOOD *B - FAIR *C - POOR.

Table IX portrays the mean acceptability scores for bajji mix with 20 per cent soya flour incorporation in the two institutions. The colour was graded good and obtained a score of 175 in I₁, while it obtained 180 in I₂. Clienteles ranked the quality of colour as fair by giving a score of 39 in I₁, and 21 in I₂. The flavour was rated good by receiving a score of 130 in I₁, and 120 in I₂ and scored fair with 66 and 54 points in I₁ and I₂. It was deemed poor when it received a score of 1 in I₂. The texture was hailed good by obtaining a score of 170 in I₁, and 110 in I₂ while it was regarded fair after it received a score of 42 in I₁, and 63 in I₂. Taste was graded good by obtaining a score of 195 in I₁, and 130 in I₂ and it was rated fair by receiving 57 and 42 scores in I₁, and I₂ and was regarded poor by receiving a score of 3 in I₂.

TABLE - X

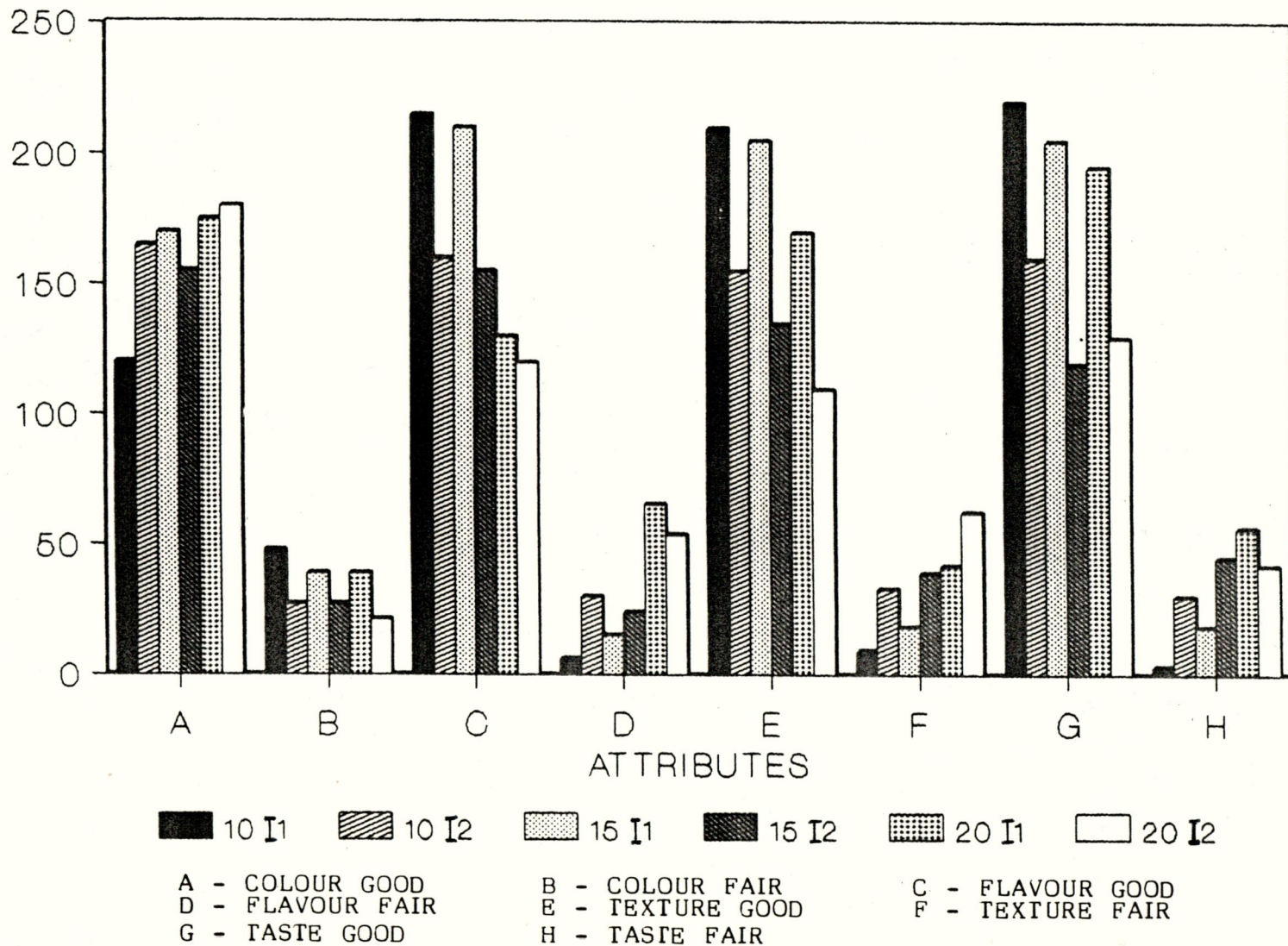
MEAN ACCEPTABILITY SCORES FOR BAJJI MIX

PERCENTAGE INCORPORATION OF SOYA FLOUR	INSTI- TUTION	COLOUR			FLAVOUR			TEXTURE			TASTE		
		A*	B*	C*	A*	B*	C*	A*	B*	C*	A*	B*	C*
10	I ₁	120	48	5	215	6	-	210	9	-	220	3	-
	I ₂	165	27	-	160	30	-	155	33	-	160	30	-
15	I ₁	170	39	-	210	15	-	205	18	-	205	18	-
	I ₂	155	27	-	155	24	1	135	39	-	120	45	1
20	I ₁	175	39	-	130	66	-	170	42	-	195	57	-
	I ₂	180	21	-	120	54	1	110	63	-	130	42	3

*A - Good *B - Fair *C - Poor

Table X portrays in comparison the level of acceptability of bajji mix with 10, 15 and 20 per cent soya flour incorporation. The bajji mix with 10 and 15 per cent soya flour was well accepted when compared to 20 per cent soya flour mix by the clientele of the 2 selected non-commercial food service institution. This study is in tune with Awasthis' (1990) statement that defatted soya flour is freely acceptable when incorporated in food formulations and can be substituted with bengal gram flour to make deep fried snack items which are easily acceptable.

FIGURE - V
MEAN ACCEPTABILITY SCORES FOR BAJJI MIX



I₁ - THE MADRAS ADVOCATES
CO-OPERATIVE SOCIETY CANTEEN

I₂ - SARADALAYA CANTEEN

b. PAKODA

The acceptability scores for pakoda mix with 10, 15 and 20 per cent soya flour incorporation are given in tables XI, XII, XIII, XIV and illustrated in figure VI.

TABLE - XI

**MEAN ACCEPTABILITY SCORES FOR PAKODA MIX WITH 10 PER CENT
SOYA FLOUR INCORPORATION**

N=79

CHARACTERISTICS	A*		B*		C*	
	I ₁	I ₂	I ₁	I ₂	I ₁	I ₂
Colour	155	120	39	24	-	3
Flavour	220	130	-	27	-	-
Texture	200	145	12	18	-	-
Taste	220	145	-	18	-	-

*A - GOOD *B - FAIR *C - POOR

Table XI indicates the mean acceptability scores for pakoda mix with 10 per cent Soya flour incorporation in the two institutions. The colour was regarded good and received a score of 155 in I₁, and obtained 120 in I₂. The colour was ranked fair by receiving a score of 39 in I₁, and 24 in I₂ and was disregarded by receiving a score of 3 in I₂. The flavour was considered good and obtained a score of 220 in I₁, and 130 in I₂ and was scored fair only in I₂ with 27 points. The texture was rated good by receiving a score of 200 in I₁, and 145 in I₂ while it was regarded fair by receiving a score of 12 in I₁, and 18 in I₂. The taste was ranked good by obtaining a score of 220 in I₁ and 145 in I₂ and was rated fair only in I₂ with 18 points.

TABLE - XII
MEAN ACCEPTABILITY SCORES FOR PAKODA MIX WITH 15 PER CENT
SOYA FLOUR INCORPORATION

N=82

CHARACTERISTICS	A*		B*		C*	
	I ₁	I ₂	I ₁	I ₂	I ₁	I ₂
Colour	115	145	125	25	-	-
Flavour	210	120	30	45	-	1
Texture	215	150	19	9	-	1
Taste	230	115	6	27	-	6

*A - GOOD *B - FAIR *C - POOR

Table XII depicts the mean acceptability scores for pakoda mix with 15 per cent Soya flour incorporation. The colour was ranked good and obtained a score of 115 in I₁, while it obtained 145 in I₂ and it was regarded fair by receiving a score of 125 in I₁ and 25 in I₂. The flavour was hailed good by obtaining a score of 210 in I₁ and 120 in I₂ while it was deemed fair when it received a score of 30 in I₁ and 45 in I₂ and was disregarded when a score of 1 was obtained in I₂. The texture was rated good by obtaining a score of 215 in I₁ and 150 in I₂ while it was regarded fair by receiving a score of 9 in I₁ and same in I₂. The taste was rated good by obtaining a score of 230 in I₁ and 115 in I₂ while it scored 6 in I₁ and 27 in I₂ for the attribute fair and was considered not up to the mark by receiving a score of 6 in I₂.

TABLE - XIII
MEAN ACCEPTABILITY SCORES FOR PAKODA MIX WITH 20 PER CENT
SOYA FLOUR INCORPORATION

N=82

CHARACTERISTICS	A*		B*		C*	
	I ₁	I ₂	I ₁	I ₂	I ₁	I ₂
Colour	170	130	21	12	-	1
Flavour	185	115	12	21	-	1
Texture	170	130	21	15	-	-
Taste	170	130	15	15	-	-

*A - GOOD *B - FAIR *C - POOR

Table XIII portrays the mean acceptability scores for pakoda mix with 20 percent soya flour incorporation. The colour was graded good and obtained a score of 170 in I₁ while it obtained 130 in I₂ and was ranked fair by obtaining a score of 21 in I₁ and 12 in I₂ and was regarded poor by obtaining 1 point in I₂. The flavour was accepted good by receiving a score of 185 in I₁ and 115 in I₂ and as fair by obtaining 12 and 21 points in I₁ and I₂ and was deemed poor when it received a score of 1 in I₂. The texture was hailed good by obtaining a score of 170 in I₁, and 130 in I₂ and regarded fair by receiving a score of 21 in I₁ and 15 in I₂. Taste was graded good by obtaining a score of 170 in I₁ and 130 in I₂ and was rated fair by receiving a score of 15 in both the institutions.

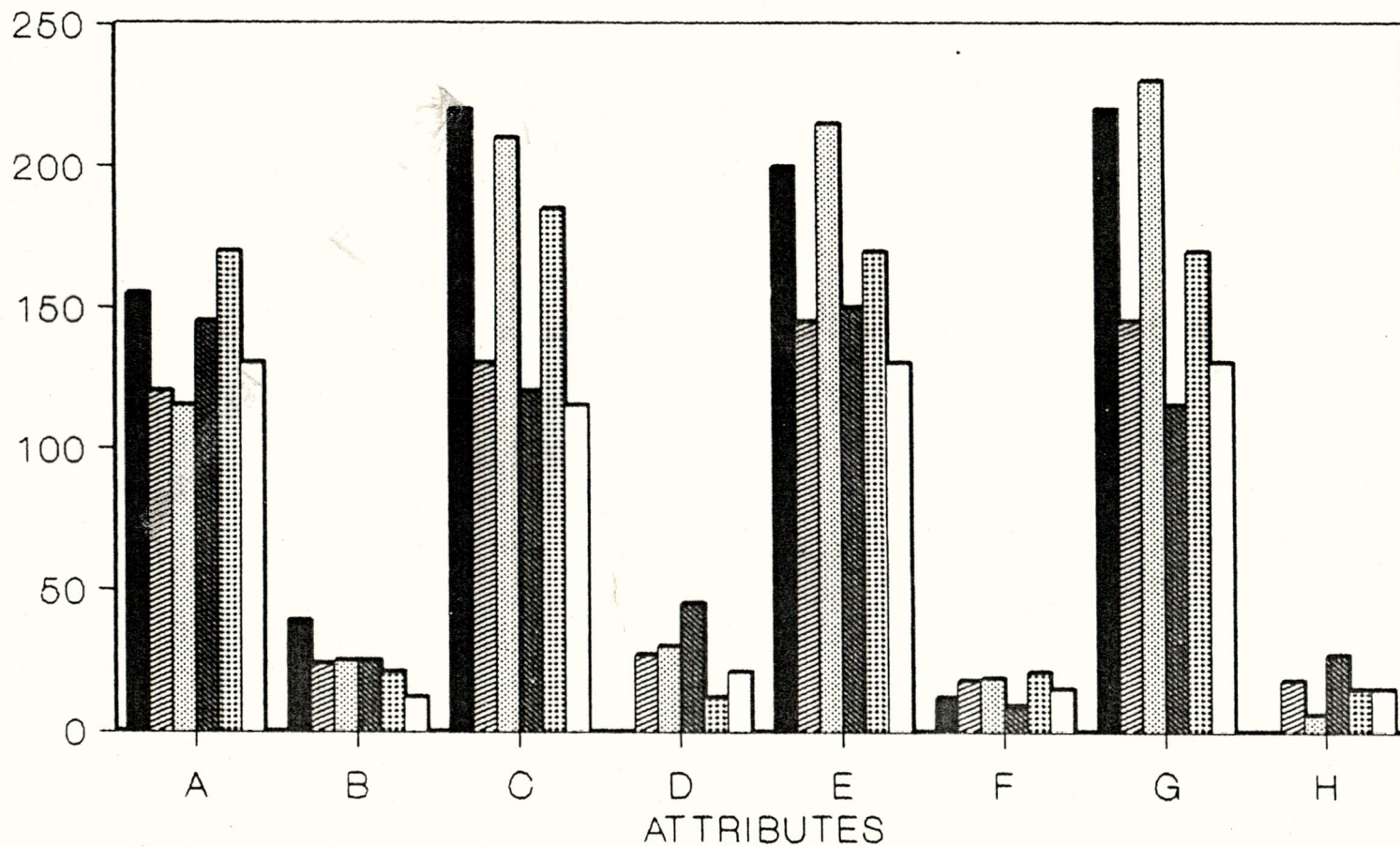
TABLE - XIV

MEAN ACCEPTABILITY SCORES FOR PAKODA MIX

PERCENTAGE INCORPORATION OF SOYA FLOUR	INSTI- TUTION	COLOUR			FLAVOUR			TEXTURE			TASTE		
		A*	B*	C*	A*	B*	C*	A*	B*	C*	A*	B*	C*
10	I ₁	155	39	-	220	-	-	200	12	-	220	-	-
	I ₂	120	24	3	130	27	-	145	18	-	145	18	-
15	I ₁	115	25	-	210	30	-	215	19	-	230	6	-
	I ₂	145	25	-	120	45	1	150	9	1	115	27	6
20	I ₁	170	21	-	185	12	-	170	21	-	170	15	-
	I ₂	130	12	1	115	21	1	130	15	-	130	15	-

*A - Good *B - Fair *C - Poor

FIGURE - VI
MEAN ACCEPTABILITY SCORES FOR PAKODA MIX



10 I1
 10 I2
 15 I1
 15 I2
 20 I1
 20 I2

A - COLOUR GOOD B - COLOUR FAIR C - FLAVOUR GOOD
 D - FLAVOUR FAIR E - TEXTURE GOOD F - TEXTURE FAIR
 G - TASTE GOOD H - TASTE FAIR

I₁ - THE MADRAS ADVOCATES
CO-OPERATIVE SOCIETY CANTEEN

I₂ - SARADALAYA CANTEEN

Table XIV portrays in comparison the level of acceptability scores of pakoda mix with 10, 15 and 20 per cent soya flour. It was found that when soya flour was incorporated with bengalgram flour at 10,15 and 20 per cent level for the preparation of pakoda it was accepted well at the three percentage levels by the clientele of the 2 institutions. This study is thus in par with Jayalakshmi and Neelakanthan's (1987) findings that soya flour could be incorporated with sorghum flour upto 50 per cent level for making deep fat fried products like methu pakoda and murukku and for the preparation of pittu, laddu, uppuma, soya flour could be blended with sorghum flour upto 30 per cent level.

C. HALWA

The acceptability scores for halwa mix with 10, 15 and 20 per cent soya flour incorporation are given in table XV, XVI, XVII, XVIII and illustrated in figure VII.

TABLE - XV
MEAN ACCEPTABILITY SCORES FOR HALWA MIX WITH 10 PER CENT
SOYA FLOUR INCORPORATION

CHARACTERISTICS	N=82					
	A*		B*		C*	
	I ₁	I ₂	I ₁	I ₂	I ₁	I ₂
Colour	135	45	27	27	5	7
Flavour	140	85	27	21	4	1
Texture	135	65	30	30	4	2
Taste	130	95	39	15	2	1

*A - GOOD *B - FAIR *C - POOR

Table XV depicts the mean acceptability scores for halwa mix with 10 per cent soya flour incorporation in the two institutions. The colour was rated good and obtained a score of 135 in I_1 while it obtained 45 in I_2 . Clienteles from I_1 graded quality of colour as fair by giving a score 27 in I_1 and it obtained the same scores in I_2 . The poorest quality obtained a score of 5 in I_1 while 7 in I_2 . The flavour of the product was rated good by scoring 140 in I_1 and 85 in I_2 while it was rated fair by receiving a score of 27 in I_1 and 21 in I_2 . The poorest quality obtained a score of 4 in I_1 and 1 in I_2 . The texture was hailed good by obtaining a score 135 in I_1 and 65 in I_2 while it was regarded fair after it received a score of 30 in I_1 and the same in I_2 and the poorest quality obtained a score of 4 in I_1 and 2 in I_2 . Taste was graded good after it obtained a score of 130 in I_1 and 95 in I_2 and it was rated fair by receiving a score of 39 in I_1 and 15 in I_2 . Taste was disregarded by receiving a score of 2 in I_1 and 1 in I_2 .

TABLE - XVI
 MEAN ACCEPTABILITY SCORES FOR HALWA MIX WITH 15 PER CENT
 SOYA FLOUR INCORPORATION

CHARACTERISTICS	N=72					
	A*		B*		C*	
	I ₁	I ₂	I ₁	I ₂	I ₁	I ₂
Colour	135	50	24	42	10	3
Flavour	180	75	24	30	1	2
Texture	175	85	21	21	3	3
Taste	210	90	9	21	-	1

*A - GOOD *B - FAIR *C - POOR

Table - XVI portrays the mean acceptability scores for halwa mix with 15 per cent soya flour incorporation in the two institutions. The colour was regarded good and received a score of 135 in I₁ and 50 in I₂. The colour was ranked fair by receiving a score of 24 in I₁ and 42 in I₂ and was considered not upto the mark by receiving a score of 10 in I₁ and 3 in I₂. The flavour was considered good and obtained a score of 180 in I₁ and 75 in I₂ and was scored fair by obtaining 24 points in I₁ and 30 in I₂ and was disregarded by receiving a score of 1 in I₁ and 2 in I₂. The texture was hailed good by receiving a score of 175 in I₁ and 85 in I₂ while it was regarded fair by receiving a score of 21 in I₁ and I₂ and disregarded by receiving a score of 3 in both the institutions. The taste was ranked good by obtaining a score of 210 in I₁ and 90 in I₂ and was rated fair by obtaining 9 points in I₁ and in I₂ and disregarded by receiving 1 point in I .

TABLE - XVII
 MEAN ACCEPTABILITY SCORES FOR HALWA MIX WITH 20 PER CENT
 SOYA FLOUR INCORPORATION

CHARACTERISTICS	N= 70					
	A*		B*		C*	
	I ₁	I ₂	I ₁	I ₂	I ₁	I ₂
Colour	160	110	27	6	3	2
Flavour	155	95	30	15	-	2
Texture	145	100	30	15	5	1
Taste	190	95	18	12	-	3

*A - GOOD *B - FAIR *C - POOR

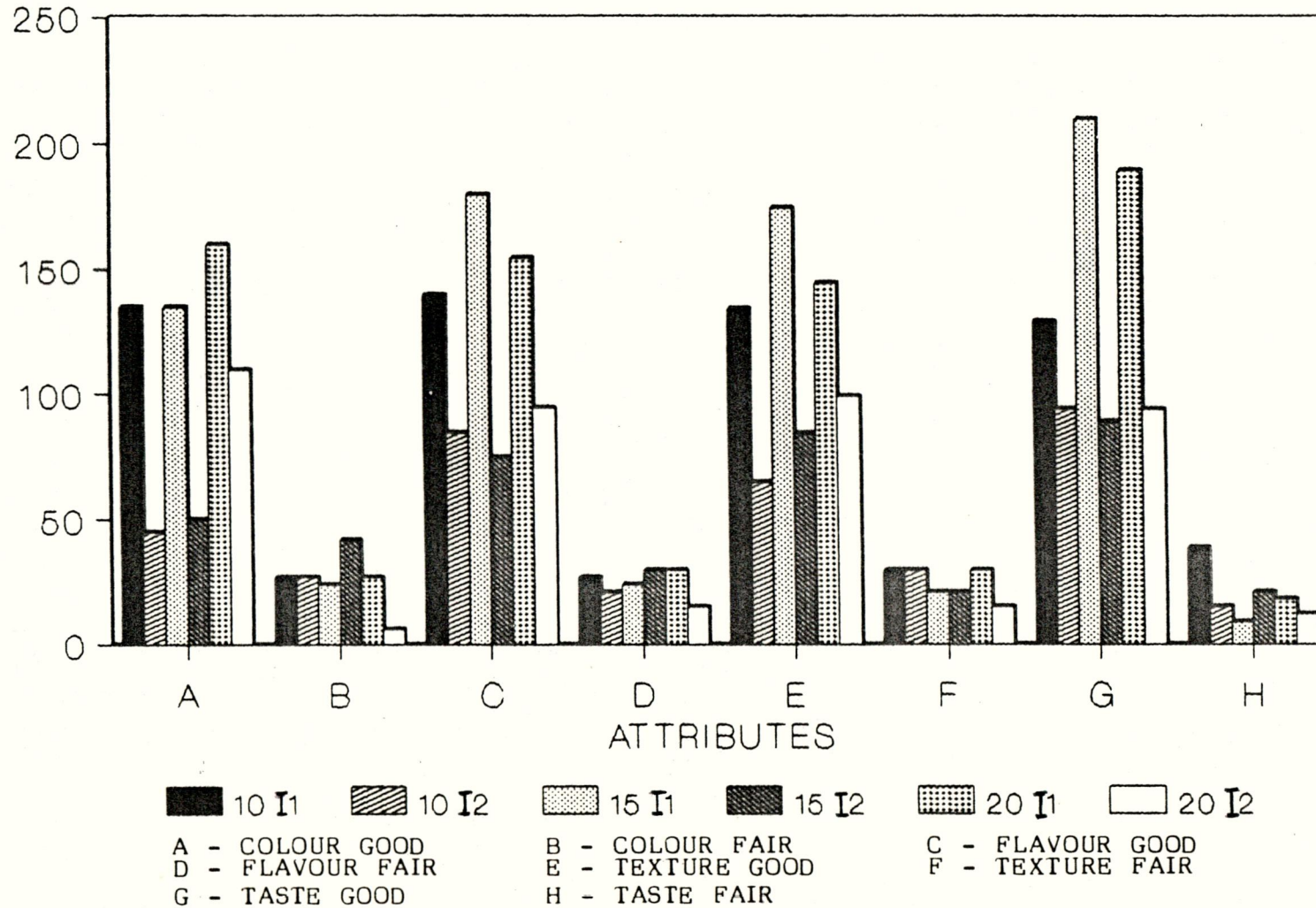
Table XVII depicts the mean acceptability scores for halwa mix with 20 per cent soya flour incorporation in the two institutions. The colour was ranked good by obtaining a score of 160 in I₁ and 110 in I₂. It was regarded as fair by receiving a score of 27 in I₁ and 6 in I₂ and regarded poor when it obtained 3 and 2 points in I₁ and I₂. The flavour was hailed good by obtaining a score of 155 in I₁ and 95 in I₂ while it was deemed fair when it received a score of 30 in I₁ and 15 in I₂ and regarded poor when it received 2 point in I₁. The texture was rated good by obtaining a score of 145 in I₁ and 100 in I₂ while it was regarded fair by receiving a score of 30 in I₁ and 15 in I₂ and considered poor when it received 5 points in I₁ and 1 point in I₂. The taste was rated good by obtaining a score of 18 in I₁ and 95 in I₂ and was rated fair by receiving a score of 18 in I₁ and 12 in I₂ and considered not up to the mark by receiving 3 points in I₁.

TABLE - XVIII
MEAN ACCEPTABILITY SCORES FOR HALWA MIX

PERCENTAGE INCORPORATION OF SOYA FLOUR	INSTI- TUTION	COLOUR			FLAVOUR			TEXTURE			TASTE		
		A*	B*	C*	A*	B*	C*	A*	B*	C*	A*	B*	C*
		10	I ₁	135	27	5	140	27	4	135	30	4	130
	I ₂	45	27	7	85	21	1	65	30	2	95	15	1
15	I ₁	135	24	10	180	24	1	175	21	3	210	9	-
	I ₂	50	42	3	75	30	2	85	21	3	90	21	1
20	I ₁	160	27	3	155	30	-	145	30	5	190	18	-
	I ₂	110	6	2	95	15	2	100	15	1	95	12	3

*A - Good *B - Fair *C - Poor

**FIGURE - VII
MEAN ACCEPTABILITY SCORES FOR
HALWA MIX**



I₁ - THE MADRAS ADVOCATES
CO-OPERATIVE SOCIETY CANTEEN

I₂ - SARADALAYA CANTEEN

The table XVIII depicts in comparison, the level of acceptability of scores of halwa mix with 10, 15 and 20 per cent soya flour incorporation.

In the present study it was found that halwa mix with 10, 15 and 20 per cent soya flour was accepted by clientele of both the institutions. The results of which are in tune with the findings of Mahajan (1985) that the halwa prepared with 2 part of soya flour and one part of suji was accepted well by pre-school children and their mothers.

D. GULABJAMUN MIX

The acceptability scores for jamun mix with 10, 15 and 20 percent soya flour incorporation are given in tables XIX, XX, XXI and illustrated in figure VIII.

TABLE - XIX
MEAN ACCEPTABILITY SCORES FOR GULABJAMUN MIX WITH 10 PER
CENT SOYA FLOUR INCORPORATION

CHARACTERISTICS	N=76					
	A*		B*		C*	
	I ₁	I ₂	I ₁	I ₂	I ₁	I ₂
Colour	135	75	30	21	10	7
Flavour	130	125	57	12	2	-
Texture	225	140	6	3	-	-
Taste	160	130	39	9	2	-

*A - GOOD *B - FAIR *C - POOR

Table XIX depicts the mean acceptability scores for gulabjamun mix with 10 per cent soya flour incorporation in the two institutions. The colour was graded good and obtained a score of 135 in I₁ and 75 in I₂ while it was regarded as fair by receiving a score of 30 in I₁ and 21 in I₂ and it was considered poor by receiving a score of 10 in

I₁ and 7 in I₂. The flavour was hailed good by obtaining a score of 130 in I₁ and 125 in I₂ while it was deemed fair when it received a score of 57 in I₁ and 12 in I₂ and was disregarded when a score of 2 points was obtained in I₁. The texture was rated good by obtaining a score of 225 in I₁ and 140 in I₂ while it was regarded fair by receiving a score of 6 in I₁ and 3 in I₂. The taste was rated good by obtaining a score of 160 in I₁ and 130 in I₂ while it scored 39 in I₁ and 9 in I₂ for the attribute fair and was considered not upto the mark by receiving a score of 2 in I₂.

TABLE - XX

MEAN ACCEPTABILITY SCORES FOR GULABJAMUN MIX WITH 15 PER CENT SOYA FLOUR INCORPORATION

N=84

CHARACTERISTICS	A*		B*		C*	
	I ₁	I ₂	I ₁	I ₂	I ₁	I ₂
Colour	100	115	72	18	1	4
Flavour	205	135	12	18	-	-
Texture	225	150	-	9	-	-
Taste	190	140	21	15	-	-

*A - GOOD *B - FAIR *C - POOR

Table XX portrays the mean acceptability scores for gulabjamun mix with 15 per cent soya flour incorporation in the two insitutions. The colour was regarded as good by receiving a score of 100 in I₁ and 115 in I₂, it was ranked

fair by receiving a score of 72 in I₁ and 18 in I₂ and was considered poor by receiving a score of 1 in I₁ and 4 in I₂. The flavour was considered good and obtained a score of 205 in I₁ and 135 in I₂ and was scored fair by obtaining a score of 12 and 18 in I₁ and I₂. The texture was hailed good by obtaining a score of 225 and 150 in I₁ and I₂, while it was regarded fair by receiving a score of 9 in I₂. The taste was ranked good by obtaining a score of 190 in I₁ and 140 in I₂ and was rated fair by obtaining 21 points in I₁ and 15 in I₂.

TABLE XXI
MEAN ACCEPTABILITY SCORES FOR GULABJAMUN MIX WITH
20 PER CENT SOYA FLOUR INCORPORATION

N = 82

CHARACTERISTICS	A*		B*		C*	
	I ₁	I ₂	I ₁	I ₂	I ₁	I ₂
Colour	100	100	60	30	5	7
Flavour	195	155	9	15	3	1
Texture	205	145	12	24	-	-
Taste	170	130	30	30	1	1

*A - GOOD *B - FAIR *C - POOR

Table XXI depicts the mean acceptability scores for gulabjamun mix with 20 per cent soya flour incorporation. The colour was ranked good by obtaining a score of 100 in I₁

and I₂. While it was regarded as fair by receiving a score of 60 and 30 in I₁ and I₂ and considered poor by receiving 5 and 7 points in I₁ and I₂. The flavour was hailed good by obtaining a score of 195 in I₁ and 155 in I₂ while it was deemed fair when it received a score of 9 and 15 in I₁ and I₂ and considered poor when it received 3 and 1 points in I₁ and I₂. The texture was rated good by obtaining a score of 205 in I₁ and 145 in I₂ and regarded fair by receiving a score of 12 and 24 in I₁ and I₂. The taste was rated good by obtaining a score of 170 in I₁ and 130 in I₂, while it was rated fair by receiving a score of 30 in both I₁ and I₂ and disregarded by receiving 1 point in I₁ and I₂.

Table XXII portrays incorporation the level of acceptability cross of gulabjamun mix with 10, 15 and 20 per cent soya flour.

The findings of the above study that gulabjamun mix based on defatted soya flour 10, 15 and 20 per cent incorporation was well accepted in both the institutions. This coincides with Subash (1984) statement that these are more than 100 ways the soya flour could be used to produce food for humans. Acceptable chappathi, laddu, omapodi, gulabjam can be prepared with soya flour.

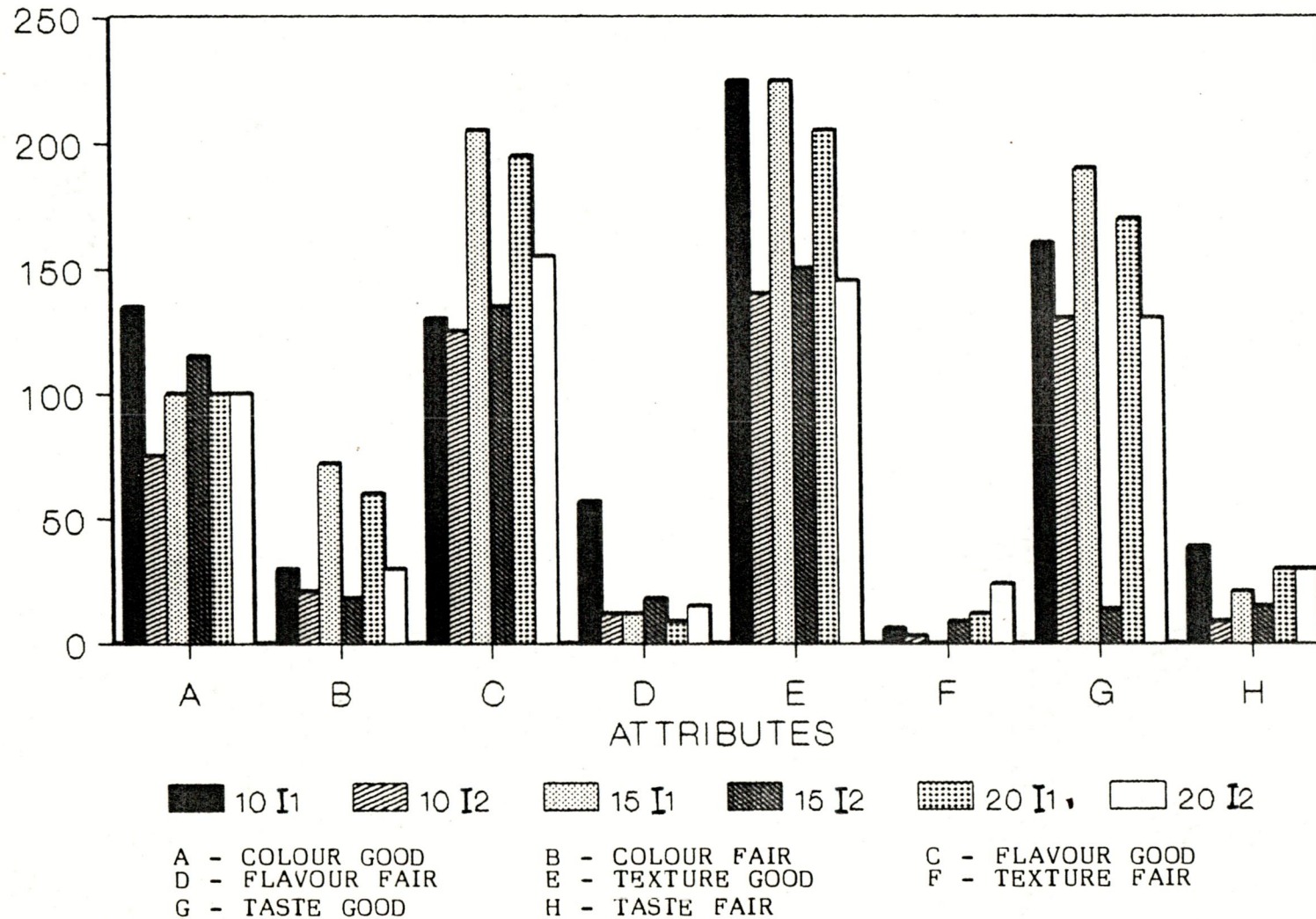
TABLE - XXII

MEAN ACCEPTABILITY SCORES FOR GULABJAMUN MIX

PERCENTAGE INCORPORATION OF SOYA FLOUR	INSTI- TUTION	COLOUR			FLAVOUR			TEXTURE			TASTE		
		A*	B*	C*	A*	B*	C*	A*	B*	C*	A*	B*	C*
10	I ₁	135	30	10	130	57	2	225	6	-	160	39	2
	I ₂	75	21	7	125	12	-	140	3	-	130	9	-
15	I ₁	100	72	1	205	12	-	225	-	-	190	21	-
	I ₂	115	18	4	135	18	-	150	9	-	14	15	-
20	I ₁	100	60	5	195	9	3	205	12	-	170	30	1
	I ₂	100	30	7	155	15	1	145	24	-	130	30	1

*A - Good *B - Fair *C - Poor

FIGURE - VIII
MEAN ACCEPTABILITY SCORES FOR
GULABJAMUN MIX



I₁ - THE MADRAS ADVOCATES
 CO-OPERATIVE SOCIETY CANTEN

I₂ - SARADALAYA CANTEN

**C. MEAN ACCEPTABILITY SCORES OBTAINED FOR ALL THE FOUR
RECIPIES PREPARED WITH SOYA FLOUR INCORPORATED MIXES**

The mean acceptability scores obtained for all the four recipes prepared with soya flour incorporated mixes is given in Table - XXIII.

TABLE - XXIII

**MEAN ACCEPTABILITY SCORES OBTAINED FOR ALL THE FOUR RECIPES
PREPARED WITH SOYA FLOUR INCORPORATED INSTANT MIXES**

Recipes with various Composition	Scores		
	Good	Fair	Poor
10	390	54	4
15	385	60	3
20	365	69	4

Table XXIII portrays the mean acceptability scores obtained for all the four recipes prepared with soya flour incorporated instant mixes. Soya at 10 percentage level of incorporation for all the four products gained a maximum score of 390 for the attribute like, 54 points were given and the product was fairly accepted and only minimum adjudged the product. Soya flour at 15 per cent levels of incorporation scored a maximum of 385 for the quality like, 60 points were given and the product was fairly accepted and only minimum adjudged the product as poor. Soya at 20 per cent level of incorporation scored 365 points for the attribute like, 69 points were given and the product was fairly accepted and only minimum adjudged the product.

SUMMARY AND CONCLUSION

V. SUMMARY AND CONCLUSION

Soyabean often called as COW OF CHINA because of its 4000 year history as the main source of protein for the Chinese. It is also referred to as the PEARL OF ORIENT. NOW this prodigious bean is seen by some as a weapon against World hunger.

This study on "EVALUATION OF INSTANT MIXES BASED ON DEFATTED SOYA FLOUR BY CLIENTELE OF NON-COMMERCIAL FOOD SERVICES", was carried out to introduce already developed instant mixes as recipes to the clientele of non-commercial food service, to calculate the nutritive value of instant mixes and to determine the extent of acceptability of soya incorporated recipes.

The instant mixes which were developed in a previous study for two savouries namely bajji and pakoda and two sweets namely halwa and gulabjamun was adopted for the present study. The soya flour was substituted at 10, 15 and 20 per cent levels in these recipes and was introduced in the two selected non-commercial food service.

Nutrient content of the four recipes was calculated and acceptability trial was conducted for three days for each

recipe and clienteles of the two institutions formed the panel members. The findings of the study are:

1. The nutrient content of the recipes indicated that substitution of soya flour improved protein and fibre content. As defatted soya flour was used the fat content decreased as the percentage of incorporation of soya flour increased in the mix and there was reduction in the energy to a very small extent.
2. The bajji prepared with 10 and 15 per cent soya flour incorporation were well accepted by all the clienteles of the two institutions when compared to 20 per cent. The flavour and texture of bajji prepared with 20 per cent soya flour incorporation was not much preferred.
3. The pakoda prepared with all the three proportions of soya were well accepted by clienteles of both the institutions.
4. The sweets halwa and gulabjamun prepared with incorporation of soya flour at 10, 15 and 20 per cent levels were well accepted by the clienteles of both the institutions.

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APPENDIX

APPENDIX - I A

RECIPES

BAJJI

SERIAL NUMBER	INGREDIENTS	AMOUNTS IN (g)			
		STANDARD RECIPE	SUBSTITUTION WITH SOYA FLOUR		
			10%	15%	20%
1.	Bengal gram flour	75	67.5	63.75	60
2.	Rice flour	25	25	25	25
3.	Chillie powder	5	5	5	5
4.	Omum seeds	2.5	2.5	2.5	2.5
5.	Cooking soda	1 Pinch	1 Pinch	1 Pinch	1 Pinch
6.	Salt	2.5	2.5	2.5	2.5
7.	Defatted soya flour	-	7.5	11.25	15
8.	Plaintain	1 in Number	1 in Number	1 in Number	1 in Number
9.	Oil for frying				

METHOD

1. The plaintain was cut transversely into thin slices and kept aside.
2. Batter of pourable consistency with instant mix was prepared.
3. Dipped the plaintain slices in the batter and deep fried them.

APPENDIX - I B

PAKODA

SERIAL NUMBER	INGREDIENTS	AMOUNTS IN (g)			
		STANDARD RECIPE	SUBSTITUTION WITH SOYA FLOUR		
			10%	15%	20%
1.	Bengal gram flour	80	72	68	64
2.	Rice flour	30	30	30	30
3.	Defatted soya flour	-	8	12	16
4.	Chillie powder	5	5	5	5
5.	Onum seeds	2.5	2.5	2.5	2.5
6.	Green chillies	5	5	5	5
7.	Cooking soda	1 Pinch	1 Pinch	1 Pinch	1 Pinch
8.	Salt	2.5	2.5	2.5	2.5
9.	Onions	75	75	75	75
10.	Corriander leaves	5	5	5	5
11.	Garlic	5	5	5	5
12.	Oil for frying				

METHOD

1. Sliced Onion, garlic and corriander leaves into small pieces.
2. Prepared a drop batter with instant mix, sliced onion, garlic and corriander leaves.
3. Dropped the prepared batter in oil and fried them till golden brown
4. Served hot.

APPENDIX - I C

HALWA

SERIAL NUMBER	INGREDIENTS	AMOUNTS IN (g)			
		STANDARD RECIPE	SUBSTITUTION WITH SOYA FLOUR		
			10%	15%	20%
1.	Fine ground semolina	90	81	76.5	72
2.	Milk powder	10	10	10	10
3.	Defatted soya flour	-	9	13.5	18
4.	Sugar	150	150	150	150
5.	Cardamom	2.5	2.5	2.5	2.5
6.	Ghee	200	200	200	200
7.	Cashewnuts	5	5	5	5

METHOD

1. Soaked the instant mix for five minutes and added cardamom, ghee and cooked on a low fire.
2. Kept stirring continuously.
3. When halwa separated from the sides, removed from stove and poured on a greased plate.
4. Allowed it to set and then cut into pieces.

APPENDIX - I D

GULAB JAMUN

SERIAL NUMBER	INGREDIENTS	AMOUNTS IN (g)			
		STANDARD RECIPE	SUBSTITUTION WITH SOYA FLOUR		
			10%	15%	20%
1.	Maida flour	75	67.5	63.75	60
2.	Defatted soya flour	-	7.5	11.25	15
3.	Skim milkpowder	25	25	25	25
4.	Dalda	15	15	15	15
5.	Cooking soda	1 Pinch	1 Pinch	1 Pinch	1 Pinch
6.	Sugar	150	150	150	150
7.	Cardamom	2.5	2.5	2.5	2.5
8.	Refined oil for frying				

METHOD

1. Dissolved sugar in two cups of warm water and prepared the syrup
2. Kneaded the gulabjamun mix with dalda and water to form a soft dough.
3. Prepared firm small balls from the dough and deep fried them until golden brown on low heat.
4. Drained fat from the fried balls and soaked in syrup. When they swell to twice their size served with a little syrup.

APPENDIX - II A

SCORE CARD FOR BAJJI

NAME OF THE RECIPE : BAJJI

NAME OF THE EVALUATOR :

EVALUATION DATE :

AGE :

QUALIFICATION :

SERIAL No.	CHARACTERISTICS	SCALE
1.	COLOUR	
	GOLDEN BROWN	5
	BROWN	3
	DARK BROWN	1
2.	FLAVOUR	
	GOOD	5
	FAIR	3
	POOR	1
3.	TEXTURE	
	SOFT AND CRISP	5
	MODERATELY CRISP	3
	HARD	1
4.	TASTE	
	GOOD	5
	FAIR	3
	POOR	1

APPENDIX - II B

SCORE CARD FOR PAKODA

NAME OF THE RECIPE : PAKODA

NAME OF THE EVALUATOR :

EVALUATION DATE :

AGE :

QUALIFICATION :

SERIAL No.	CHARACTERISTICS	SCALE
1.	COLOUR	
	GOLDEN BROWN	5
	BROWN	3
	DARK BROWN	1
2.	FLAVOUR	
	GOOD	5
	FAIR	3
	POOR	1
3.	TEXTURE	
	CRISP	5
	SOFT	3
	HARD	1
4.	TASTE	
	GOOD	5
	FAIR	3
	POOR	1

APPENDIX - II C
SCORE CARD FOR HALWA

NAME OF THE RECIPE : HALWA

NAME OF THE EVALUATOR :

EVALUATION DATE :

AGE :

QUALIFICATION :

SERIAL No.	CHARACTERISTICS	SCALE
1.	COLOUR	
	ORANGE	3
	REDDISH ORANGE	1
	YELLOW	5
2.	FLAVOUR	
	GOOD	5
	FAIR	3
	POOR	1
3.	TEXTURE	
	GOOD (NON - STICKY)	5
	SOFT	3
	STICKY	1
4.	TASTE	
	GOOD	5
	FAIR	3
	POOR	1

APPENDIX - II D
SCORE CARD FOR GULAB JAMUN

NAME OF THE RECIPE : GULAB JAMUN

NAME OF THE EVALUATOR :

EVALUATION DATE :

AGE :

QUALIFICATION :

SERIAL	CHARACTERISTICS	SCALE
1.	COLOUR	
	BROWN	3
	DARK BROWN	1
	GOLDEN BROWN	5
2.	FLAVOUR	
	GOOD	5
	FAIR	3
	POOR	1
3.	TEXTURE	
	SOFT	5
	MODERATELY HARD	3
	HARD	1
4.	TASTE	
	GOOD	5
	FAIR	3
	POOR	1

APPENDIX - III A
NUTRIENT CONTENT OF BAJJI MIX

1. NUTRIENT CONTENT OF STANDARD BAJJI MIX

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Rice flour	25	87	1.7	0.12	0.05
2.	Bengal gram flour	75	279	15.6	4.2	0.9
3.	Chillie powder	5	12	0.8	0.31	1.51
4.	Omum seeds	2.5	9	0.4	0.54	0.53
Total			387	18.5	5.17	2.99

2. NUTRIENT CONTENT OF BAJJI MIX WITH 10 PER CENT SOYA

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Rice flour	25	87	1.7	0.12	0.05
2.	Bengal gram flour	67.5	251	14	3.78	0.60
3.	Defatted soya flour	7.5	26	3.9	0.07	0.74
4.	Chillie powder	5	12	0.8	0.31	1.51
5.	Omum seeds	2.5	9	0.4	0.54	0.53
Total			385	20.8	4.82	3.43

3. NUTRIENT CONTENT OF BAJJI MIX WITH 15 PER CENT SOYA

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Rice flour	25	87	1.7	0.12	0.05
2.	Bengal gram flour	63.75	237	13.26	3.57	0.76
3.	Defatted soya flour	11.25	39	5.8	0.11	1.1
4.	Chillie powder	5	12	0.8	0.31	1.51
5.	Omum seeds	2.5	9	0.4	0.54	0.53
Total			384	21.96	4.65	3.95

4. NUTRIENT CONTENT OF BAJJI MIX WITH 20 PER CENT SOYA

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Rice flour	25	87	1.7	0.12	0.05
2.	Bengal gram flour	60	223	12.48	3.36	0.72
3.	Defatted soya flour	15	52	7.72	0.15	1.48
4.	Chillie powder	5	12	0.8	0.31	1.51
5.	Omum seeds	2.5	9	0.4	0.54	0.53
Total			383	23.1	4.48	4.29

APPENDIX - III B

NUTRIENT CONTENT OF PAKODA MIX

1. NUTRIENT CONTENT OF STANDARD PAKODA MIX

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Rice flour	30	104	2	0.15	0.06
2.	Bengal gram flour	80	298	16.6	4.48	0.96
3.	Chillie powder	5	12	0.8	0.31	1.51
4.	Omum seeds	2.5	9	0.4	0.54	0.53
Total			423	19.8	5.48	3.06

2. NUTRIENT CONTENT OF PAKODA MIX WITH 10 PER CENT SOYA

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Rice flour	30	104	2	0.15	0.06
2.	Bengal gram flour	72	268	14.9	4.03	0.86
3.	Defatted Soya flour	8	26	3.9	0.07	0.74
4.	Chillie powder	5	12	0.8	0.31	1.51
5.	Omum seeds	2.5	9	0.4	0.54	0.53
Total			419	20.92	5.10	3.7

3. NUTRIENT CONTENT OF PAKODA MIX WITH 15 PER CENT SOYA

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Rice flour	30	104	2	0.15	0.06
2.	Bengal gram flour	68	251	14	3.78	0.60
3.	Defatted Soya flour	12	42	6.1	0.12	1.19
4.	Chillie powder	5	12	0.8	0.31	1.51
5.	Omum seeds	2.5	9	0.4	0.54	0.53
Total			418	22.22	4.9	3.89

4. NUTRIENT CONTENT OF PAKODA MIX WITH 20 PER CENT SOYA

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Rice flour	30	104	2	0.15	0.06
2.	Bengal gram flour	64	237	13.26	3.57	0.76
3.	Defatted Soya flour	16	56	8.24	0.16	1.58
4.	Chillie powder	5	12	0.8	0.31	1.51
5.	Omum seeds	2.5	9	0.4	0.54	0.53
Total			418	23.62	4.73	4.44

APPENDIX - III C

NUTRIENT CONTENT OF HALWA MIX

1. NUTRIENT CONTENT OF STANDARD HALWA MIX

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Semolina	90	313	9.36	0.72	0.18
2.	Cardamom	2.5	6	0.25	0.05	0.50
3.	Milk powder	10	36	3.8	0.01	-
Total			355	13.41	0.78	0.68

2. NUTRIENT CONTENT OF HALWA MIX WITH 10 PER CENT SOYA

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Semolina	81	282	8.42	0.64	0.16
2.	Defatted soya Flour	9	32	4.63	0.09	0.89
3.	Cardamom	2.5	6	0.25	0.05	0.50
4.	Milk powder	10	36	3.8	0.01	-
Total			356	17.1	0.71	1.55

3. NUTRIENT CONTENT OF HALWA MIX WITH 15 PER CENT SOYA

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Semolina	76.5	266	7.95	0.61	0.15
2.	Defatted soya flour	13.5	47	6.95	0.13	1.33
3.	Cardamom	2.5	6	0.25	0.05	0.50
4.	Milk powder	10	36	3.8	0.01	-
Total			355	18.95	0.8	1.98

4. NUTRIENT CONTENT OF HALWA MIX WITH 20 PER CENT SOYA

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Semolina	72	250	7.48	0.57	0.14
2.	Defatted soya flour	18	63	9.27	0.18	1.78
3.	Cardamom	2.5	6	0.25	0.05	0.50
4.	Milk powder	10	36	3.8	0.01	-
Total			355	20.8	0.81	2.42

3. NUTRIENT CONTENT OF GULAB JAMUN MIX WITH 15 PER CENT SOYA

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Maida	63.75	222	7.0	0.56	0.18
2.	Defatted soya flour	11.25	39	5.8	0.11	1.1
3.	Milk powder	25	89	9.5	0.02	-
4.	Cardamom	2.5	6	0.25	0.05	0.50
Total			356	22.55	0.74	1.78

4. NUTRIENT CONTENT OF GULAB JAMUN MIX WITH 20 PER CENT SOYA

SERIAL NUMBER	INGREDIENTS	AMOUNT g	ENERGY K.Cal	PROTEIN g	FAT g	FIBRE g
1.	Maida	60	209	6.6	0.53	0.17
2.	Defatted soya flour	15	52	7.72	0.15	1.4
3.	Milk powder	25	89	9.5	0.02	-
4.	Cardamom	2.5	6	0.25	0.05	0.50
Total			356	24.07	0.75	2.15