

# Acceptability Trials of Ready to Eat Snacks with Soya Flour on Pre-School Children

BY

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# Introduction

I. ACCEPTABILITY TRIALS OF READY TO EAT SNACKS WITH  
SOYA FLOUR ON PRE-SCHOOL CHILDREN

INTRODUCTION:

For centuries Chinese have called the Soyabean "Yellow Jewel" or "Great Treasure" . Now this prodigious bean is seen by some as a weapon against world hunger. (National geographic 1987)

Health is the greatest asset in life and good nutrition is the foundation for health. Any investment as Devadas 1987<sup>Points Out</sup> towards improving the nutritional status of an individual is an investment for the wealth of the nation.

Growth is a key factor or indicator of child health and development. Growth failure is quite common in the developing countries. Almost one out of every two or three children suffer from some degree of growth failure (UNICEF 1985).

Fulfilment of the health and nutritional needs of children is crucial to the well being of the nation, since they are the biggest resource for development. Children below six years constitute 21 percent of the Indian population. They particularly those in the pre-school age are the most neglected

segment of the population from nutritional stand point. (Devadas 1983).

The average Indian diet consists primarily of cereals and pulses contributing to about 80 percent of the total caloric intake. Pulses which contribute to about 10 percent of the food grain consumption are the major source of protein in the cereal based diet. The production of pulses in India during the last decade (76-86) has remained static at about 11.76 million tonnes (Ali 1987).

In adequate diet and the consequent malnutrition are serious threats to the growth and development of the nation. Vijayaraghavan(1981) paints a dismal picture:-

A majority of the children born in low income families in India are very much shorter and lighter than the children born in the better off families. Their weights are below 75 percent of the standard weight for age.

Malnutrition is wide spread in India mainly because poverty is pervasive. children are usually the first and worst victims of material poverty in the family, in the form of starvation hunger or undernourishment (UNICEF 1986).

Malnutrition results primarily due to lack of calories and is often accompanied by a deficiency of protein as well. Since animal proteins are in short supply and costly, plant proteins have received considerable attention by virtue of their availability, low cost, nutritional and functional attributes. The nutritional potential of soyabean in this context is considerable. It contains 40 percent protein and 20 percent oil, characteristic of a good food product having high protein energy ratio (Sulebele 1987).

Thus Soyabean being rich in protein and energy is considered to be a "Wonder Bean" to solve the protein energy gap in developing countries. It also has a unique feature of utility because it is a food crop as well as a cash crop for the oil industry (SOPA convention report 1987).

Problems encountered in using soya-beans for food include antinutritional factors, beany flavor, disagreeable taste and difficulty in cooking. These problems are not really unique to soya beans but rather common to many beans and pulses widely consumed around the world. Because of their peculiar flavor and taste also high fat content, low carbohydrate content, lack of starch and compact texture. Soyabeans does not cook as soft or as readily as many other beans.

Undoubtedly cultural traditions dictate the food habits, but the inherent aversion of people to anything new also curbs the popularity of soyabeans. They are scarcely known to people in many areas of the world. However with proper cooking procedures and combining soya in traditional recipes they can be included in everyone's diet. Thus soyabean foods can be promoted to the poor undernourished populations where the need is greatest.

Soya flour was found appropriate to be blended with other flours so as to incorporate it in traditional recipes. Rather than in other forms such as whole beans or flakes.

Studies on full fat Soya flour blended with cereal, millet and legume flours are found to result in satisfactory traditional preparations (Gandhi et al 1983)

Due to the high protein and caloric content in Soya flour, it was thought that various preparations from full fat soya flour could be used to overcome protein calorie malnutrition seen mainly in preschool children by supplementing these preparations.

Though many studies have been done on soya beans and soya flour it is still not clear whether it would be acceptable to consumers if made available.

Thus seeing the need to study the feasibility of introducing various soya preparation and evaluate their acceptance this study was taken up.

The main objectives of the study were;

- A) Formulation of recipes with full fat soya flour for supplementing the diets of pre-school children.
- B) Finding out the acceptability of the prepared products.
- C) Studying the shelf life and evaluating the chemical changes taking place during storage of the flours used.

- D. Prevalence of PCM in pre-school children and effect of soya supplementation.
- E. Quality changes of full fat soya flour during storage.

# Review of Literature

## II. REVIEW OF LITERATURE

The literature pertaining to the study on "Acceptability trials of recipes with soya flour on pre-school children" is reviewed under the following headings.

- A. Nutritive value of soya beans and inactivation of antinutritional factors.
- B. Soya flour processing and uses
- C. Various soya flour recipes developed with full fat soya flour.
  - 1. Weaning mixtures by fortification with cereals.
  - 2. Soya flour incorporated foods and their acceptability
    - a. In traditional dishes
    - b. In bakery products
    - c. In combination with sorghum
    - d. In novel foods

A. NUTRITIVE VALUE OF SOYA BEANS AND INACTIVATION OF ANTINUTRITIONAL FACTORS:

Soyabeans have been used as a food for over 3 Millenia, but only in this century have they been subjected to a variety of processing steps to tailor their functionalities to suit our purposes. While the soyabean is classified commercially as an oil seed, in fact it is a relatively deficient source of vegetable oil, soyabeans contain about 20 percent oil and 40 percent protein (stauffer 1989).

The nutritional quality of soya products is determined not only by the quality and availability of the amino acids which make up the protein of such products but is also markedly affected by the processing conditions which are employed in their manufacture the most important factor in this regard is the application of heat treatment which serves to inactivate a number of naturally occurring constituents of soyabean. Trypsin inhibitors, phyto haemagglutinins, goitrogens and antivitamins are all destroyed by heat treatments and harsh processing conditions. Excessive heat treatment may lead to the destruction of Amino acids  $\frac{1}{2}$  -  $\frac{1}{3}$ rd of cystine was lost due to excessive heat treatment in addition arginine, tryptophan, histidine and serine have also

been found to be partially destroyed or inactivated due to excessive heating. (Liener 1981).

Various methods used for inhibitor inactivations have been described. According to manorama & Sarojini (1982) puffing, roasting, soaking, boiling in water, soaking & Steaming under 15 /lb pressure was best followed by soaking & boiling, puffing and roasting for trypsin inhibitor inactivation.

Dry roasting at 120° C for 12 hours in an oven did not affect methionine content but tryptophan got reduced in roasted meals PER values were found to be superior than those which were autoclaved Trypsin inhibitor activity (TIA) was apparently reduced to 75 percent and haemagglutinin until to 0.2 percent (Kapoor and Gupta 1977).

The trypsin inhibitor activity was completely destroyed in

- a) Unsoaked Soyabean
- b) Beans soaked in water for 12 hours
- c) Dehulled beans soaked for 12 hours.

By boiling them in water for 25, 15 & 7.5minutes, respectively. Heating for 30 min in an autoclave (121°C) was necessary to destroyed trypsin inhibitor

activity in a solution. Haemagglutinin activity was completely destroyed by boiling unsoaked beans in water for 45 minutes (Antunes & Agarbeiri 1977).

#### B. SOYA FLOUR PROCESSING AND USES:

Soya Beans contain trypsin inhibitors haemagglutinins & saponins which reduce the nutritive value. These are also present in many of the pulses and oil seeds but only in smaller quantities. These inhibitors and toxic factors could be inactivated when soyabean is processed properly. Trypsin inhibitor can be readily inactivated by heat especially moist heat (Vaidehi 1981).

Kouzeh et al (1983) have described a procedure on the laboratory and industrial scale for the production of full fat soya flour of high nutritive value and long shelf life. The procedure involves infrared radiation of soya beans followed by holding in an insulated bin production. Costs are reduced due to the use of relatively low temperature elimination of the pre conditioning step & elimination of drying after processing. A preliminary test is also reported using the flour in dutch white bread.

According to Lopez (1979) their method involves conditioning of soya beans to 23 Percent moisture by soaking for 10 minutes and tempering for 1 hour. Soya beans were then heated in an air dryer at 99° C r 110° C when tap water was used for conditioning there was a decrease in Trypsin inhibitor activity 80 percent of product gave good results with organoleptic and baking tests.

Full fat soya flour was made by roasting whole soyabeans in a heated agitated salt bed followed by dehulling and grinding. PER's of 2.11 - 2.31 compared to 2.50 for reference casein were achieved with a roasting bed temperature of 206 - 234° C and treatment items of 15 - 24 samples. the process reduced the level of anti trypsin activity 75 percent under these roasting conditions results demonstrate the use of this dry heat process in making full fat soya flour with a high protein quality the potential advantages of the process in developing countries is very good (Jansen & Harper 1978).

The full fat soya flour should have the following characteristics.

- Moisture % (Maximum - 10.0
- Crude fat % 18 - 22

|                        |         |
|------------------------|---------|
| Protein % (N x 6.25)   | 38 - 44 |
| Crude fibre %(Maximum) | 3.5     |
| Ash % (Maximum)        | 6.0     |

According to the WHP guideline -  
(1980.)

Lewis (1980) describes a novel flour manufacturing process - PSM. It is a full fat soya flour. It has many unique functional properties of value to the food industry. It is high in protein, free from cholesterol and bland in flavour. It may be used as a major ingredient in many food products. PSM may serve as an alternative to such items as milk solids, nuts, eggs, antioxidants, emulsifiers and as a bulk ingredient in selected foods.

#### C. VARIOUS SOYA FLOUR RECIPES DEVELOPED WITH FULL FAT SOYA FLOUR

##### 1. Weaning Mixtures: By fortification with cereals.

Various weaning mixtures of high protein and high calorie have been developed using soya flour.

The characteristic composition and nutrient value of soyabean formulas as necessary supplements and the relevance of undesirable substances in the beans are checked. Suitability of the diet for infants with reduced intestinal capacity for absorption

and digestion and possible or manifested or allergy conditions or other considerations are taken into account for possible feeding with soya supplements. Soyabean diets are regarded as the most appropriate alternative to cows milk formulas, in respect of price and flavour for feeding programmes excluding cows milk protein and lactose (Brand & Hebel 1986).

Soyabeans blanced then ground in 3 parts by weight of 0.05 percent  $\text{NaHCO}_3$  were mixed with ground maize or rice, gelled then drum dried, a mixture with 25 to 30 percent soya beans had the best nutritive value 20 percent beans could be used before the organoleptic property decreased significantly. The mixture was very suitable for a weaning food. (Cheryan et al 1976).

Another spray dried weaning food is based on soya dhal "skim milk powder" and barley malt. the infant food had a protein content of 24.8 percent. the per was 2.7 as compared to 3.0 of the Skim Milk Powder, methionine fortification enhanced PER to 3.0 (chandrashekara et al 1966.).

A weaning food "Soylac" was prepared by blending (Proportions unstated) soyabean, wheat and rice flours, skimmed milk, minerals and water, after cooking and drying vitamins were added soylac

contained moisture 6.5, protein 19.4, fat 3.8, ash 4.2, Crude fibre 1.3 carbohydrate 64.9 Calcium 1.1 percent and iron 14 mg. Operative and standardised net protein utilization was 60.5 and 90. percent respectively, PER 2.75 and net dietary protein energy 12.5 percent soylac mixed water improved the condition of infants with marasmus. soylac is said to be a complete weaning food of high nutritive value. It is supposed to be better than cows milk and contains adequate iron and vitamin - C (Sheik et al 1986).

Payumo et al (1979) have prepared a high energy protein supplementary food from a combination of full fat soya flour with other indigenous materials. Various combination of rice Con, full fat soya flour, mung bean flour, coconut protein with mini shrimp powder or non fat dry milk as the source of animal protein were tested for acceptability, storage quality and nutritional value. The products contain an average of 20 percent protein of good nutritional quality. Storage studies showed that the products have satisfactory nutrients and flavour stability on storage for 6 months under room temperature.

Lukoo (1981) from Tanzania reports that "Lisha" a weaning food is being manufactured. Lisha is a blend of maize and soyabean blend, 65 percent Maize grits and 28 percent dehulled full fat soya bean, 5 percent milk powder, minerals and vitamins.

The Institute of nutrition bangkok, thailand has developed weaning food mixtures based on the thai standard for infant food with reference to quantity and quality of fat and protein rice is the main ingredient supplemented with soyabean, mungbean or fish meal as protein sources and energy sources such as sesame seed or ground nut protein and fat content range from 13.2 to 18.2 and from 9.2 to 13.29 g /100 g. respectively energy content range from 437 to 454 calories per 100 gms education in the preparation, and use of the weaning foods in villagles is given by health workers (Valyasevi and Dhanamitta 1986).

Laurent (1988) reports about a small production unit run by 2 women producing 500 bags of 500 gms "Misola" flour, from millet 50, soya 30, & groundnut 10 percent with sugar salt and dried boabab leaves or yeast. The flour is used specifically for feeding underweight children and mothers are taught how to produce the flour themselves.

## 2) SOYA FLOUR INCORPORATED FOODS AND THEIR ACCEPTABILITY

### ! ) IN TRADITIONAL DISHES:

Many Indian snack foods with incorporation of soya flour has been tried. Snack foods like halwa laddu nankhatai have been prepared replacing the traditional ingredients with soya upto 50 percent which were reported to be quite acceptable (Shusma Kumari et al 1979).

Efforts have been made to prepare full fat soya flour free from anti-nutritional factors for incorporation with wheat flour for making chapathis. Different blends of full fat soya flour and wheat flour were prepared and used for making Chapathis by traditional method. There was almost complete elimination of Trypsin inhibitor activity in chapathis. Sensory evaluation showed that Chapathis containing 10 percent full fat soya flour was acceptable while those containing 25 percent full fat soya flour was neither liked nor disliked (Verma, Mishra Chauhan 1987).

Soya dhal was also incorporated with black gram dhal for the preparation of Idli. Consumer evaluation of the idlis showed that incorporation at 25 and 50 percentage as substitution for black gram dhal was accepted. Adverse effects on flavour was noticeable at a higher level of soyabean incor-

- poration & this was not accepted (Vaidehi and Priyadrshini 1976).

Full fat soya flour was blended with cereal, Millet or pulse flours to make a variety of Indian Traditional products. It was judged by a trained panel, that all the products namely Chapathi, Poori, Pakoda, sev, Bread Pokada, say Peanut Crihps, Burfi, Mysore Pak and halwa were acceptable with 30 percentage significant difference among the products (Gandhi, Miłhra & Ali 1983).

b) In Bakery Products (Bread & Biscuits)

High protein biscuits made with ragi and soya flour were found to be both acceptable and nutritious (Vaidehi et al 1985)

Baked products (Particularly biscuits) rich in protein and of high nutritive value are prepared from soya concentrates, sodium Caseinate, hydrogenated Ground nut oil, which is blended with wheat flour, sugar water, salts and mineral salts, baking powder and flavouring. The biscuits contain 10-20 percent total protein and atleast 90 percent of the lysine is preserved. The biscuits were reported to be acceptable (Chablaix R 1981).

Key role of Cereals in the human nutrition and Nutritional benefits gained by fortifying wheat based foods with soya flour have given a successful development for soya fortified foods including bread, pasta & Biscuits (Tsen 1983).

According to pomeranz (1977) bread baked from 90g, wheat flour and 10g. of Chemically treated germinated soya flour when used for bread making was consumer acceptable & thus could be the answer to a low priced nutritionally improved protein enriched bread.

Blends of 94 percent wheat flour and 6 percent soya flour, 88 percent wheat flour and 12 percent soya flour, bread was baked from stored samples 80-90 percent of volume was retained panel evaluations of odour was done blends showed differences between samples stored from 0-6 months and also in flavour. No significant differences in baking performances or storage stability were found among 3 commercial soya flour blends (Bean et al 1977).

Heimann et al (1981) studied the changes of flavour compounds caused by addition of soya flour to short bread. They isolated and identified volatile flavour compounds by GLC-MS analysis. These flavour

compounds were 4-hexanol, di-methyl furfural, Benzaldehyde - B- Phenylethanol, 2-3 Methyl 3 hydroxy pyrone, 2 formyl pyrrole & 4 Vinyl guaiacol.

c) IN COMBINATION WITH SORGHUM (JOWAR).

Sorghum (Jowar) and soyabean and dried skim milk powder in 60: 30:10 proportion was used in the production of biscuits. 30 percentage jowar flour was pre-gelatinised, the remaining 30 parts was mixed with 30 parts full fat soya flour, 10 parts dried skim Milk and 0.5 parts carboxy - methyl cellulose (CMC) Vegetable fat was rubbed with brown sugar to required consistency and mixed with other dry ingredients pre-gelatinised flour improved considerably flavour and texture and also appearance of the biscuits. The protein rich biscuits were acceptable to the consumers (Rao, Rajor & Patil 1984).

In another study it was concluded that soya flour could be incorporated with sorghum flour upto 50 percent level for making deep fat fried products like pakoda, Murukku etc. The flavour blends could be stored in tin containers for a period of 2 months. Incorporation of soya flour not only increased the nutritive value of sorghum flour but also its keeping quality (Jayalakshmi and Neelakantan 1987).

"Puppets" is a snack food prepared from extension of soya fortified sorghum grits & is fortified with vitamins & Minerals to increase overall nutrient content an analysis of the nutrient composition of the snack food was undertaken by the food & nutrition research institution & the foods drug administration of phillipines. The food is a good source of calories contains 3.8 gms protein per packet which contributes 9.5 percent of the RDA for protein for children of pre-school & school going age. The product has been well accepted & approved for formal launching in the market (Gucrrero 1979).

d) IN NOVEL FOODS:

The effect of fortifying two snack items (Pretzels and Ampaw) with desicated coconut and soya bean flour was investigated. The fat content increased by incorporating coconut protein content by 100 percent with soya flour. the level of fortification was 30 percent. The products were highly acceptable and lends itself to cottage level processing thus it was suggested as an ideal vehicle for nutrition fortification (Gonzales 1983).

Valle and Visconti (1983) tabulated the nutrient content of fortified bread, granola bars,

peanutbutter, soya extended with soft cheese and soya analogue chloriza (dry sausage) used in a Mexican School breakfast programme. The foods have been used for 3 years with good acceptance and no detectable intolerance symptoms were observed.

Milk powder in Vanilla and Chocolate ice creams were partially substituted by soya flour at 10,20 and 30 percent and stored at 100 ° F at 3 . hours. Organoleptic property of the ice cream was studied. It was concluded that the ice cream was acceptable at 10 percentage level of incorporations also the ice cream could be produced at low price (EL Deeb & Salaam 1984).

#### IV. PREVALENCE OF PCM IN PRE-SCHOOL CHILDREN AND EFFECT OF SOYA FLOUR SUPPLEMENTATION.

PCM is a term that covers Kwashiorkor and Marasmus in various degrees mild to severe. Etiologically the principal causes of PCM are due to deficient intake of proteins of good biological value (Geetha Sharma and Mriduala 1987). In India Children between the age group of one to 4 years constitute more than 15 percentage of the total population and are most vulnerable to protein calorie malnutrition (Kakker et al 1987).

Soyabean and its products have been used in feeding infants for prevention of protein calorie malnutrition in weaned infants and pre-school children in developing countries (Swaminathan 1966).

Bhagavan et al (1964) formulated an infant food based on full fat soya flour and peanut protein isolation containing 20 % protein compared favourably with skim milk powder in their efficiency to cure kwashiorkor in children.

Feeding trials in children for 6 months have shown that daily supplementation with 50 gms of 4:3:3 blend of full fat soya flour, groundnut flour and coconut meal fortified with adequate amounts of Vitamins and Mineral salts to diets habitually consumed by children have showed significant increase

in height, weight, red blood cell count and haemoglobin level as compared with the controls (Doraiswamy et al 1964).

Alabastio et al (1979) devised recipes to provide 6, 25 or 50 servings of 30 dishes which would be accepted by pre-school children and their mothers. Most dishes included a mixture of maize and soya oil meal (CSB) and some included rolled oats, both food stuffs provided under a welfare scheme and local food stuffs. Tables given for each dish measured the content of energy or protein per cup and the portions to be served to the children of various age groups. Food was accepted or liked by all of them.

The nutritional value was studied of lunches provided for 346 children of pre-school age in Sao Paulo state, Brazil in 18 pre-school education and feeding centres. The preparations most often served in all the centres were enriched milk, textured soyabean protein, soups and gruels with incorporated soya flour. Mean energy value of the lunches were 210 to 403 K. Calories and 5.7 gms to 12 gms of protein. The lunch contributed 13 - 20 percent of recommended energy intake and 21 to 44 percent of recommended protein intake of the pre-schoolers. Vitamin A, Thiamine, Riboflavin and iron were below recommended amounts though calcium intake was sufficient. On the whole food was well accepted by the pre-

schoolers (Mazzilli 1988).

"SOYAVEN" a nutritious low cost infant formula based on Oats & soyabeans used in Mexico to alleviate Malnutrition. The processing & production of soyabean has won the 1983 IFT food technology industrial achievement award (Mermelstein 1983).

## V. QUALITY CHANGES OF FULL FAT SOYA FLOUR DURING STORAGE

Protein denaturation of soyabeans and meals as a function of storage time and conditions have been studied.

Whole beans were more resistant to deterioration during storage than meals and full fat soya flour deteriorated more rapidly than defatted meals. Quality seems to be more readily retained in the native state when the intracellular membranes are intact (Saio, Kobayakawa & Kito 1982).

The behaviour of soya flour when stored in polythene bags under different room conditions was studied based on data generated on changes in moisture content free fatty acid and insect infestation. It was concluded that full fat soya flour could be stored for six months without quality deterioration under proper storage (Gandhi, Neewani & Ali 1985).

Wheat flour and soya flour seperately and after blending (80:20) were stored for 4 months at room temperature in polythene containers moisture

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free fatty acids & Iodine number of the stored samples were determined at monthly intervals. The stored flour blend showed good keeping quality during the entire storage period (Gupta et al 1977).

## Experimental Procedure

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## III. METHODOLOGY

## A. SELECTION OF MATERIAL

- 1) PREPARATION OF FULL FAT SOYA FLOUR FROM BEANS
- 2) OTHER RAW MATERIALS

## B. PREPARATION AND STANDARDISATION OF RECEIPES

## C. SELECTION OF SUBJECTS

## D. SURVEY OF SOCIO-ECONOMIC PROFILE OF THE SUBJECTS

## E. NUTRITIONAL ASSESSMENT OF THE SUBJECTS THROUGH;-

- 1) HEIGHT AND WEIGHT MEASUREMENTS
- 2) QUANTIFICATION OF DAILY NUTRIENT INTAKE

## F. SENSORY EVALUATION OF THE PRODUCTS

- 1) SELECTION OF THE TASTE PANEL
- 2) FORMULATION OF THE SCORE CARD
- 3) CONDUCTING THE ACCEPTABILITY TRIALS

## G. CHEMICAL ANALYSIS OF THE FLOURS USED

- 1) ACID VALUE
- 2) PEROXIDE VALUE
- 3) MOISTURE PERCENT

## A. SELECTION OF MATERIAL

Wheat based products have gained popularity and efforts are being made for partial substitution of wheat with locally available grains and pulses (Chandrashekar & Shurpalekar 1983).

Full fat soya flour has also gained advantage over other forms of soya products due to its capacity to be incorporated with other flours in traditional recipes (Mishra 1987).

### 1. Preparation of full fat soya flour from beans:

Soya bean "Hardee" variety was bought from the agricultural college Bangalore. The beans were cleaned and roasted in 1 kg lots. It was ground lightly in a stone mill into dhal and then milled in an ordinary flour mill to obtain full fat soya flour.

### 2. Other Raw Materials

Wheat and Maida were the other main ingredients to which soya flour was to be incorporated. Maida flour was obtained from a roller flour mill, which was freshly prepared.

Whole wheat was purchased from the local shop and milled to obtain the wheat flour. Due to the other necessary ingredients were purchased from the local shops.

B. PREPARATION AND STANDARDISATION OF RECIPES :

The recipes selected for the study were:

- a) Hot biscuits
- b) Sweet biscuits
- c) Ribbon pakoda
- d) Diamond cuts

All the recipes were standardised with four variations each, one without soya flour as a standard and the rest with 15,20 and 25 percent levels of incorporation with soya flour. the standardised recipes are given in appendix ( II )

Though biscuits and fried items are not the staple food items, they are popularly consumed as snacks by people from all classes and of all age groups they are specially liked by children, and are considered to be ideal for the supply of nutrients for the vulnerable groups like growing children pregnant mothers and convalescents (Tsen 1973).

C. SELECTION OF SUBJECTS:

All the subjects selected for the study were pre schoolers in the age group of 2-5 years. They were selected randomly from an ICDS school.

D. SURVEY OF SOCIO-ECONOMIC PROFILE OF THE SUBJECTS:

A survey was done to gather information such as age, occupation of the head of family, and monthly per capita income.

E. NUTRITIONAL ASSESSMENT OF THE SUBJECTS THROUGH:

1) Height and Weight Measurements

The heights and weights of all the selected pre-school children were measured and compared with that of the recommendations of the I C M R (1985).

2) Quantification of daily nutrient intake:

The daily food consumed by the subjects was measured by doing the 3 day, Food weighing method and the mean nutrient intakes were calculated. The interview schedule used for collecting information about the socio economic profile, height weight and daily nutrient intake is given in the appendix (IV).

#### F. SENSORY EVALUATION OF THE PRODUCTS:

Evaluation of the acceptability of food products in terms of sensory variable is an important step in determining research priorities.

Sensory evaluation of studies are of importance from the point of processing of a product and the consumers acceptance of the product which is judged by the eye, smell and taste showing the consumers satisfaction and thus satisfies the value of the processor of the product (Hogg & Samuelson 1983).

The following steps were involved in sensory evaluation of the recipes.

##### 1) Selection of the taste panel:

According to Piggot (1984) a panel is a group of assessors chosen to participate in a sensory test.

A preliminary study was conducted with the panel of judges being post graduate students chosen randomly. All of them being familiar with the sensory evaluation of food.

The main taste panel consisted of the sixty selected group of pre-schoolers from the I C D S school.

## 2. Formulation of the Score Card:

As per piggot (1984) scoring is a form of rating using a numerical score where the numbers form an interval or ratio scale i.e, the different scores have a definite and demonstrated relationship to each other.

For the preliminary study with post graduates as the panel a five point score card was prepared and for the main study with pre-schoolers as the panel members, a simple three point score card was prepared.

The score cards were formulated by following the suggestions given by Amerine et al (1965) The factors taken into consideration were appearance texture taste, flavor and overall acceptability. They are listed in the appendix (III)

## 3. Conducting the acceptability trials

All the recipes were prepared, the

standard and those with different levels of incorporation of soya flour. These were then given to the panel members along with the score card.

In case of the pre-schoolers, they were asked for their opinion and the investigator ticked the appropriate opinions. Each child was asked individually.

Proper environmental conditions were made available to the judges as recommended by Piggot (1984).

Samples of the same size and shape were served simultaneously in identical plates sufficient amount of the samples were offered for evaluation

Time of the day for sensory evaluation is very important, the morning time between 10 A.M. and 11 A.M. was selected for conducting acceptability trials. A glass of water was provided to ensure that there was no overlapping in taste evaluation of the samples.

#### G. Chemical Analysis of the Flours Used;

To ensure that flour is suitable for the purpose for which it is intended to be used,

Careful testing must be carried out. Due to relatively high percentage of fat content in full fat soya flour rancidity may develop.

Development of rancidity with a resultant loss of quality and acceptability can occur in products due to degradation at various points along the chain from harvest to storage. (Gaillard 1983).

The acid value and Per-oxide values were obtained from soya, wheat and maida flours to study the development of rancidity in the flours.

Analysis of soya, wheat and Maida flours were done on the day of preparation of the flour and at one month intervals for a period of 3 months, using standardised procedures . . . . .

#### 1) Acid Value:

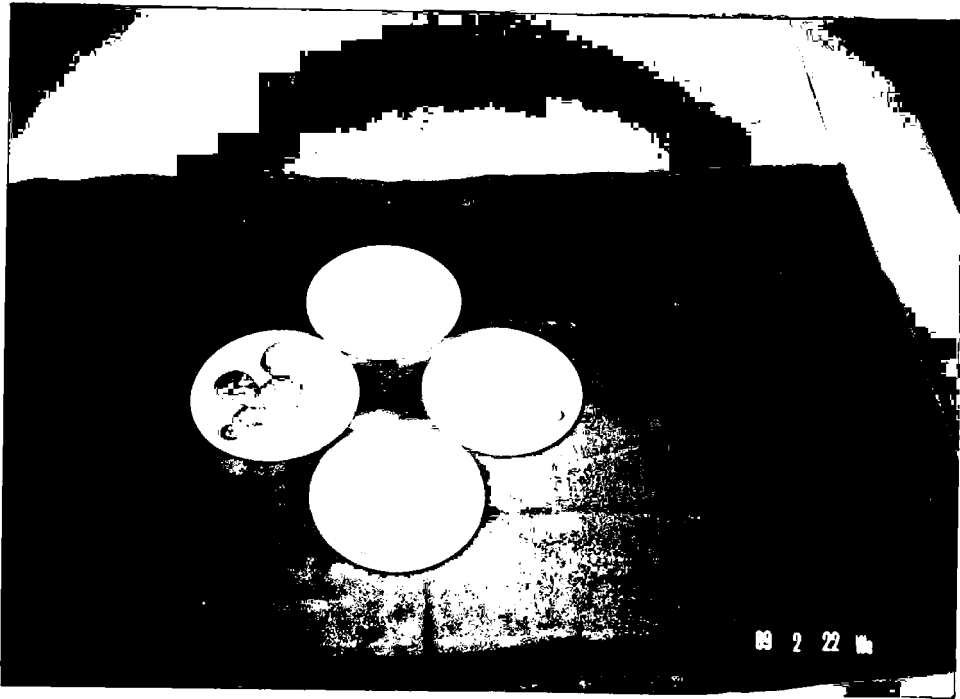
According to Pearson (1970) the acid number of fat or oil is defined as the number of Milligrams of Sodium hydroxide required to neutralise, the free fatty acids in one gram of the sample. Hence this indicates the amount of free fatty acids in one gram of the sample.

## 2. Peroxide value:

When unsaturated fats get oxidised peroxides are formed and these are estimated by peroxide value analysis. This gives the degree of oxidation that has taken place in the flour. Thus peroxide value was estimated to find out the degree of oxidation in the flours.

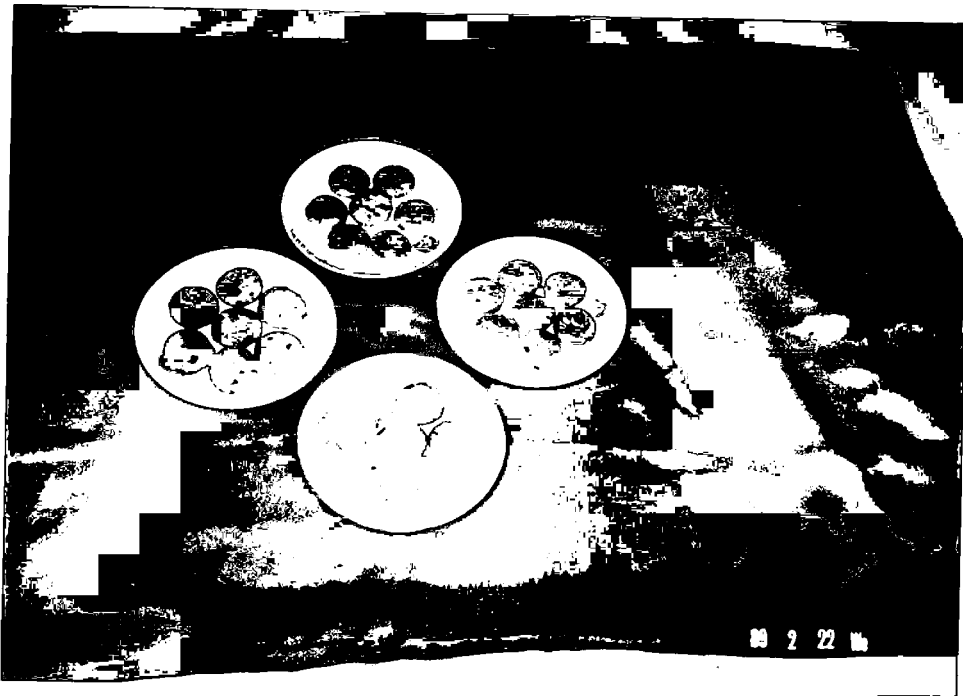
## 3. Moisture:

The moisture percent in the flour was found out as the absorption of moisture during storage influenced the quality of the flour.



SWEET BISCUITS

CLOCKWISE FROM TOP :- STANDARD, 15 AND 25/-



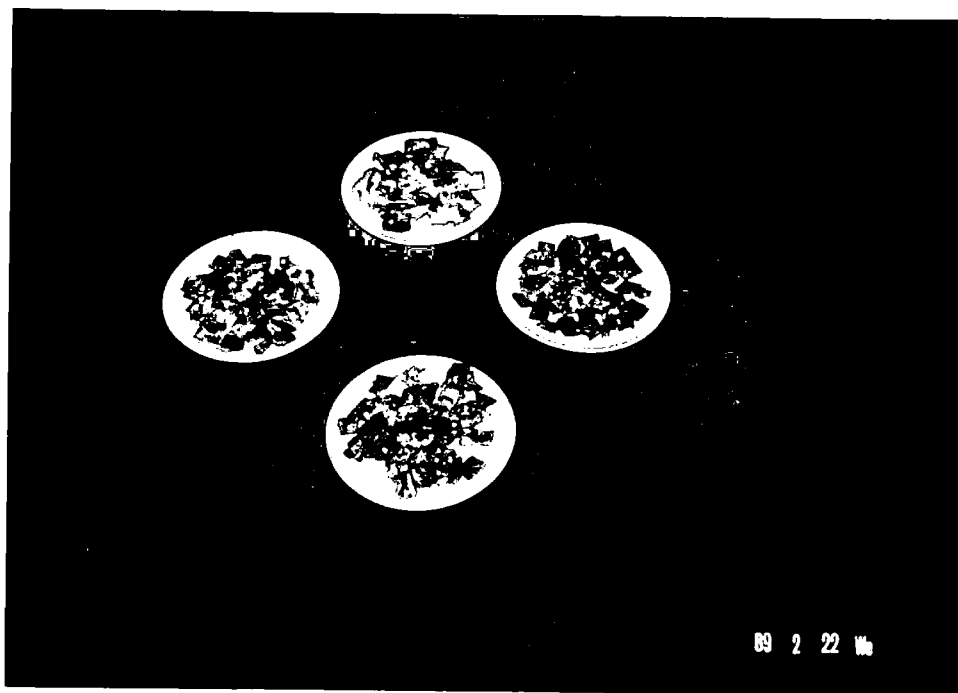
HOT BISCUITS

CLOCKWISE FROM TOP :- STANDARD 15, 20 AND 25/-



RIBBON PAKODA

CLOCKWISE FROM TOP :- STANDARD 15 20 AND 25-1.



DIAMOND CUTS

CLOCKWISE FROM TOP: STANDARD 15, 20 & 25-1.

## Results and Discussion

#### IV. RESULTS AND DISCUSSION

The findings of the study on "ACCEPTABILITY TRIALS OF RECIPES WITH SOYA FLOUR ON PRE-SCHOOL CHILDREN" are discussed under the following headings.

- A) Socio Economic profile of the subjects
- B) Nutritional status as assessed by
  - 1) Height weight measurements
  - 2) Mean day's Nutrient intake
- C) Acceptability trials of soya flour incorporated foods
- D) Comparative study of storage properties of the flours used.

##### A. SOCIO-ECONOMIC PROFILE OF THE SUBJECTS

In the experimental group 60 pre-school children were selected. 41.7 percent of them were in the age group of 2.1-3 years, 23.3 percent were between 3.1 - 4 years and 35 percent between 4.1 - 5 years.

##### OCCUPATION:

The occupation which is the major source of income to the family is referred to in this study. The survey conducted reveals that cent percent of the family members were engaged as Coolies.

The results of the survey revealed that 23.3 percent had the per-capita Monthly income of Rs. 21-40, 8.3 percent had an income of Rs. 41-60. Majority of the families had a monthly percapita income of Rs. 61-80 as 50 percent had this income level. 10 Percent had an income of Rs. 81-100 and 8.4 percent had a monthly per capita income of Rs. 121-140. Thus from the above table it can be seen that the total per-capita income per month is very much below the poverty level.

B. NUTRITIONAL STATUS:

The nutritional status of the selected pre-school children were assessed by taking their height, weight and calculating their daily nutrient intake.

Height:

TABLE-I HEIGHTS OF THE PRE-SCHOOL CHILDREN (N=60).

|                                 | Height in cms. |           |            |             |
|---------------------------------|----------------|-----------|------------|-------------|
|                                 | 85.1-90.0      | 90.1-95.0 | 95.1-100.0 | 100.1-105.0 |
| Number of samples in percentage | 8.4            | 35.0      | 46.6       | 10.0        |

Table I shows the heights of the selected pre-schoolers. the study reveals that 8.4 percent of the children had a height of 85.1 - 90.0 cms, 35 percent had a height of 90.1 - 95.0 cms, 46.6 percent had a height of 95.1 - 100.0 cms and 10 percent had a height of 100.1-105.0. cms.

On comparing these heights to the standard height given by the I C M R (1985) which is  $98.3 \pm 9.063$  cms, it was found that 56.6 percent of the selected children met the standard height

TABLE-III WEIGHTS OF THE PRE-SHCOOL CHILDREN (N-60)

|                                 | 8-8.9 | 9-9.9 | 10-10.9 | 11-11.9 | 12-12.9 | 13-13.9 | 14-14.9 | 15-15.9 |
|---------------------------------|-------|-------|---------|---------|---------|---------|---------|---------|
| Number of samples in percentage | 1.67  | 1.70  | 6.66    | 30.0    | 28.30   | 13.33   | 15.0    | 334     |

Table II gives a picture of the weights of the selected pre-schoolers, according to the study 1.67 percent of the children had a weight 8-8.9 kg. 1.7 percent had a weight of 9-9.9 kgs. 6.66 percent had a weight of 10-10.9 kgs.

30 percent of the children had a weight of 11-11.9 & 28.3 percent had 12-12.9 kgs. 13.3 percent had weights of 13-13.9 kgs and 15 percent had 14-14.9 kgs. Only 3.3 percent had weight of 15 - 15.9 kgs. the mean standard height given by I C M R is  $15.57 \pm 2.38$  kgs.

On comparing the weights of the selected pre-school children, only 18.3 percent of them met the standard weight since most of the children belong to very poor families, their weights were very low when compared to the standard. This may be due to the ignorance of the parents who were mostly illiterate.

Nutrient-intake:

TABLE -- III -NUTRIENT-INTAKE OF THE SUBJECTS

|                       | nutrient intake     |                     |                      |
|-----------------------|---------------------|---------------------|----------------------|
|                       | Protein (g)         | Fat(g)              | Calories (K.cal)     |
| Mean average 1 intake | 16.00<br>$\pm 2.65$ | 15.38<br>$\pm 6.25$ | 849.0<br>$\pm 99.25$ |
| Mean RDA, ICMR 1985   | 19.60               | 28.75               | 1950                 |

From the above table the mean nutrient intake of the pre-school subjects can be obtained. The mean average intake of proteins by the children was  $16.0 \pm 2.65$  g. This value is lesser than the mean RDA given by the I C M R 1985. The protein in the diet mainly came from the dhal served in the school lunch programme. The home diets of these selected children had very little protein content excluding that obtained from cereals.

The mean fat intake was  $15.38 \pm 6.25$ g and this intake of fat was again lesser than the recommended by the I C M R, The mean RDA given is 28.75 g.

The study also revealed that the mean caloric intake was  $849 \pm 99.25$  K. Cals. which again was lesser than the mean I C M R standard value of 1950 K. Cals for children in the age group of 2 - 5 years.

On the whole the mean Nutrient intake of the children did not meet the specified recommended allowances given by the I C M R (1985).

In order to overcome the existing gap in their nutrient intake to a certain extent low cost, full fat soya flour recipes could be very useful. The recipes developed contain the following amounts of nutrients.

TABLE IV NUTRIENT content of the prepared recipes

| Products                        | Protein<br>(g) | Fat<br>(g) | Energy<br>K.Cal |
|---------------------------------|----------------|------------|-----------------|
| Biscuits<br>(hot & Sweet)       | 15.0           | 30         | 750             |
| Ribbon Pakoda &<br>Diamond cuts | 18             | 35         | 780             |

If the recipes developed with soya flour incorporation are accepted well by pre - school children, then definitely a great change can be brought about in their health status by introducing soya in feeding programs. In order to check the acceptability of recipes based on soya flour a preliminary acceptability trial was carried out with a selected group of panel members.

C) Acceptability trials of soya flour incorporated foods

1. On a panel of 10 adult judges
2. On the selected pre - school children

Acceptability trials on a panel of 10 adult judges.

Table : V Statistical evaluation of different products at various level of soya flour incorporation (n = 10)

|                | t = Values         |                     |                    |                    |
|----------------|--------------------|---------------------|--------------------|--------------------|
|                | Product I          | Product II          | Product III        | Product IV         |
| Standard Vs 15 | 12 <sup>**</sup>   | 11.48 <sup>**</sup> | 4.14 <sup>**</sup> | 2.83 <sup>**</sup> |
| Standard Vs 20 | 6.5 <sup>**</sup>  | 7.5 <sup>**</sup>   | 4.48 <sup>**</sup> | 5.12 <sup>**</sup> |
| Standard Vs 25 | 2.89 <sup>**</sup> | 7.0 <sup>**</sup>   | 2.88 <sup>**</sup> | 8.13 <sup>**</sup> |
| Standard Vs 20 | 2.33               | 1.70                | 2.43               | 2.5                |
| 15 Vs 25       | 0.27               | 0.63                | 2.32               | 2.68               |
| 20 Vs 25       | 2.45               | 0.93                | 1.36               | 2.33               |

\*\* - Significant at 1% level.

On comparing the standard with the products at 15 percent level of soya flour incorporation the difference in acceptability was found to be statistically significant. The products with 15 percent soya flour incorporation may have not been accepted due to a colour difference in the products and the characteristic beany flavor. This was observed in all four products prepared.

When the standard was compared with the products at 20 percent level of soya flour incorporation again a difference in acceptability was found to be statistically significant. This may have been <sup>due to</sup> a darker colour, the intensity of which was much greater than the products at 15 percent.

The same was observed when the standard was compared with the product at 25 percent level of soya flour incorporation, the difference in acceptability being statistically significant.

On comparing 15 percent level soya flour incorporated products with those at 20 percent level of incorporation, the difference in acceptability was found to be statistically not significant. This shows that the rate of acceptability of products at 15 percent and 20 percent was similar, the reason could be attributed to the fact that the subjects could not differentiate much between the two levels of incorporation.

Comparing the 15 percent level soya incorporated products with those at 20 percent. The difference in acceptability was again statistically not-significant. This was seen again <sup>when</sup> 20 percent levels of soya incorporated foods were compared with 25 percent levels. The reasons for this could be that there was not much difference in colour, texture & flavor among the products with various levels of soya flour incorporation.

## 2. ACCEPTABILITY TRIALS ON PRE-SCHOOL CHILDREN

After testing the acceptability of the various recipes with selected panel members, the selected pre-school children were served with the recipes to find out the acceptability.

At a time only one preparation was given to the selected pre-school children. After a days gap another preparation was served. In the same way all the four preparations were given to the children. A trial was carried out with the preparations. After a days gap the actual acceptability tests were started following the same procedure and the acceptability assessed with the help of a check list by the investigator.

The results of the acceptability of the various recipes based on soya flour are presented in the Table VI, VII, VIII & IX.

PRODUCT: 1

SWEET BISCUITS

TABLE : VI Percentage acceptability of sweet biscuits by the selected pre-school children.

| Product I with different composition | Attributes (Percent) |         |         |
|--------------------------------------|----------------------|---------|---------|
|                                      | Like                 | Neutral | Dislike |
| Standard                             | 98.34                | 1.66    | -       |
| 15%                                  | 53.34                | 46.66   | -       |
| 20%                                  | 66.85                | 33.35   | -       |
| 25%                                  | 26.67                | 73.33   | -       |

For the first product that is sweet biscuits 98.34 percent liked the product where as 1.66 percent had a neutral attitude for the standard. the neutral attitude for the standard was observed because few of the children had an aversion to sweet taste.

At 15 percent level of soya flour incorporation 53.34 percent liked the product while 46.66 percent had a neutral attitude. at 20 percent level of incorporation 66.65 percent liked the product and 33.35 labelled it as neutral.

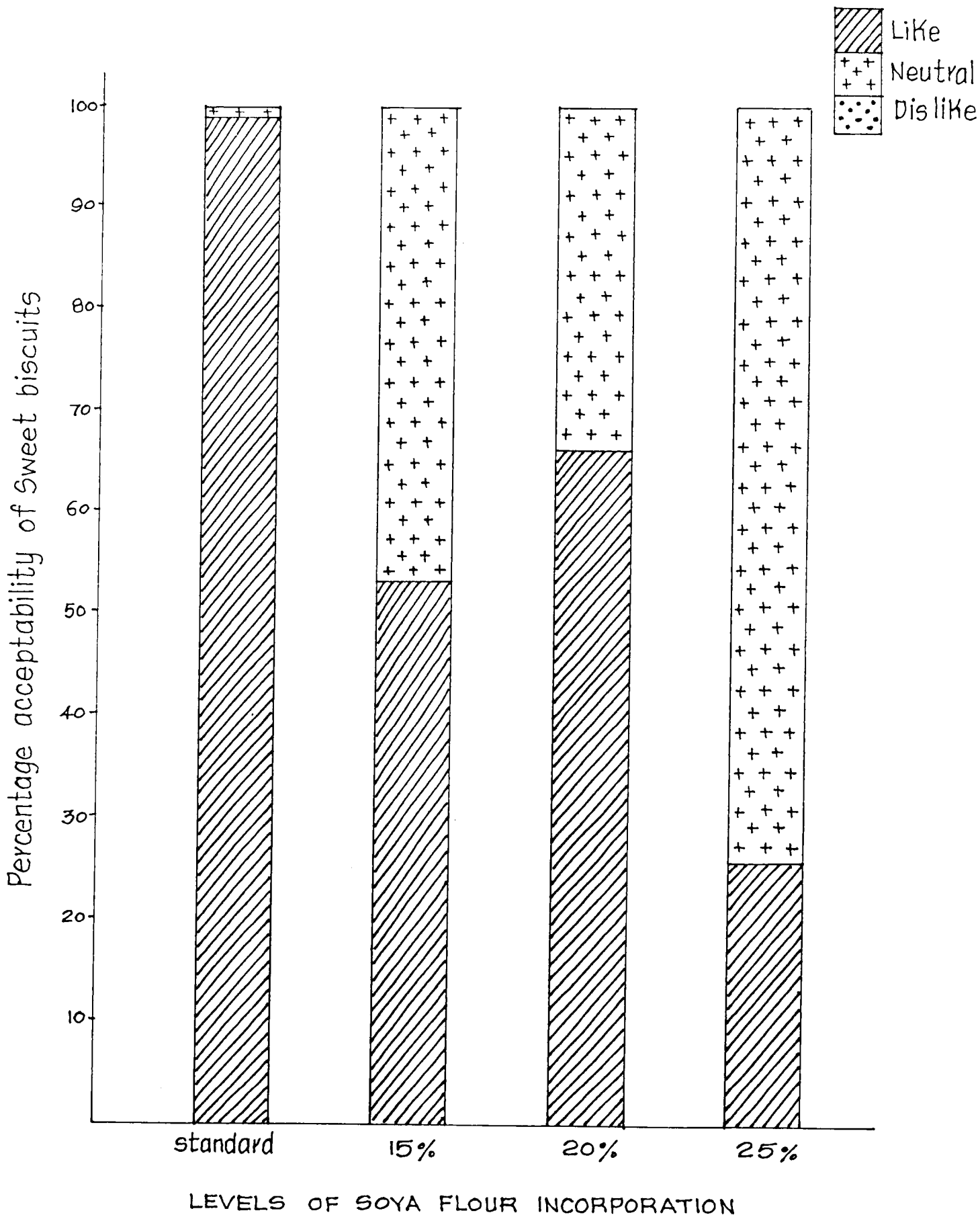
At 25 percent level of incorporation only 26.67 percent accepted the product and 73.33 percent had a neutral attitude.

The biscuits with 15 percent soya flour incorporation did not have the characteristic brown colour but at 20 percent incorporation the appearance and colour was very good. thus 20 percent level of soya incorporated biscuit was better accepted, at 25 percent level of incorporation the biscuits were a dark brown colour and a beany flavour was detectable. Making it less acceptable.

None of the children disliked the product, though a significant difference was observed in acceptability at various levels of incorporation of soya flour. A negative co-relation was seen, between acceptability and levels of incorporation of soya flour that is as the soya flour concentration was increased there was a decrease in acceptability.

Figure. 1

# ACCEPTABILITY OF SWEET BISCUITS AT VARIOUS LEVELS OF SOYA FLOUR INCORPORATION



## PRODUCT - II

## HOT BISCUITS

TABLE - VII Percentage acceptability of hot biscuits by the selected pre-school children.

| Product II with different composition | Attributes (percent) |         |         |
|---------------------------------------|----------------------|---------|---------|
|                                       | Like                 | Neutral | Dislike |
| Standard                              | 93.34                | 6.66    | -       |
| 15 %                                  | 63.35                | 35.0    | 1.65    |
| 20 %                                  | 48.33                | 48.33   | 3.34    |
| 25%                                   | 30.0                 | 41.8    | 28.0    |

The second product being hot biscuits, the standard biscuit was liked by 93.34 percent and 6.66 had a neutral attitude. At 15 percent and 6.66 had a neutral attitude. At 15 percent level of incorporation 63.35 percent liked the product while 35 percent had a neutral attitude, 1.65 percent said that they disliked the product.

At 20 percent level of incorporation of soya flour 48.33 percent liked the product and the same percentage of subjects said that they had a neutral attitude 3.34 percent disliked the product.

At 20 percent level of incorporation of Soya flour 48.33 percent liked the product and the same percentage of subjects said that they had a neutral attitude 3.34 percent disliked the product.

At 25 percent level of incorporation of soya flour 30 percent liked the product, 41.8 percent had a neutral attitude and 28.20 percent disliked it.

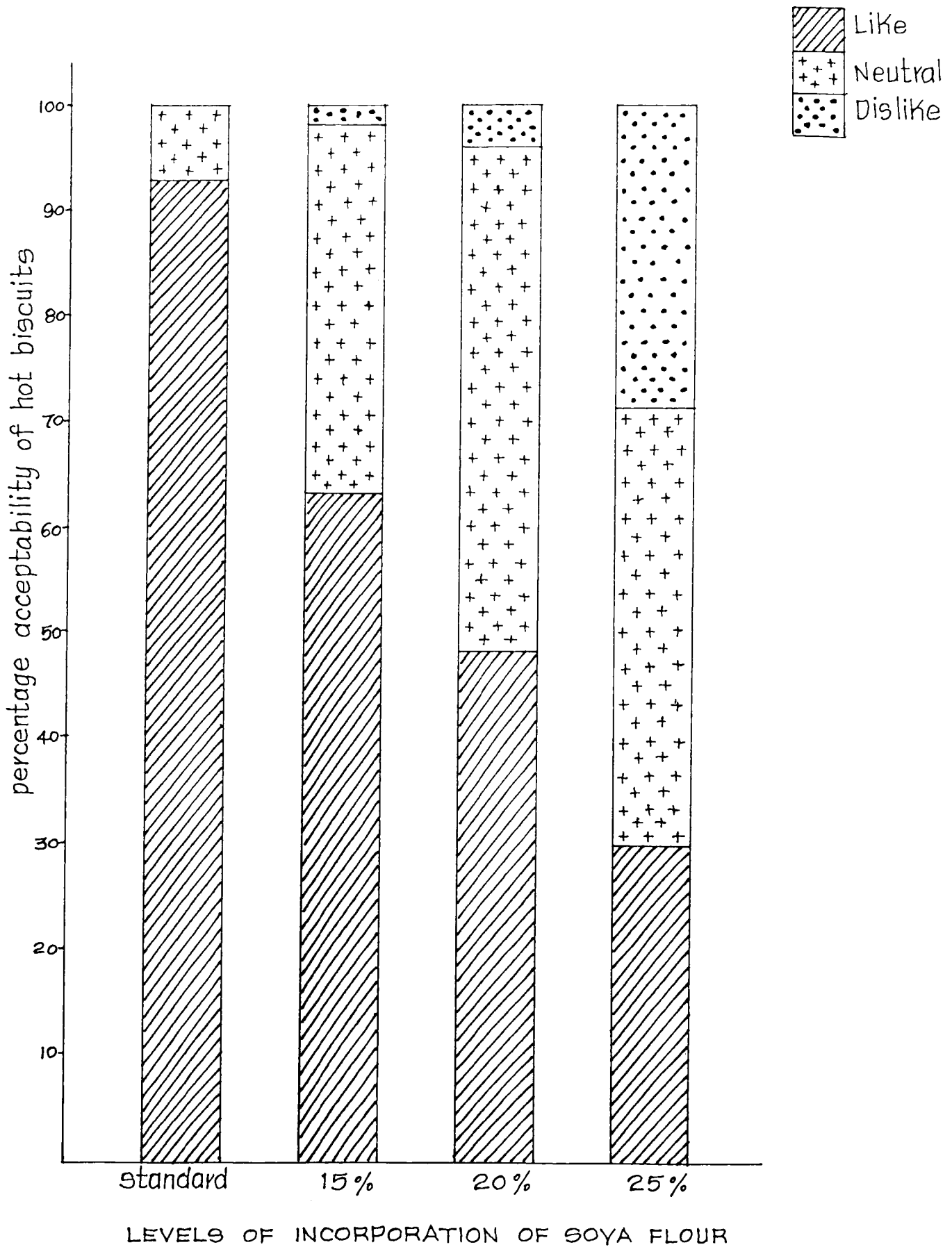
The main reason observed for decrease in acceptability and increase in the percent of dislike was due to the beany flavor, more evident in hot biscuits than the sweet one, because the vanilla essence in sweet biscuits masked the beany flavor to some extent.

Here again a negative Co-relation was observed that is as the level of soya flour incorporation was increased there was a decline in acceptability & an increase in the dislike attribute.

The decline in the acceptability of both biscuits with 20 and 25 percent level of soya flour may be due to the high level of incorporation and the beany flavor of full fat soya flour.

Figure: 2

ACCEPTABILITY OF HOT BISCUITS AT VARIOUS LEVELS OF SOYA FLOUR INCORPORATION



PRODUCT - III

## RIBBON PAKODA

Table : VIII Percentage acceptability of ribbon pakoda by the selected pre-school children.

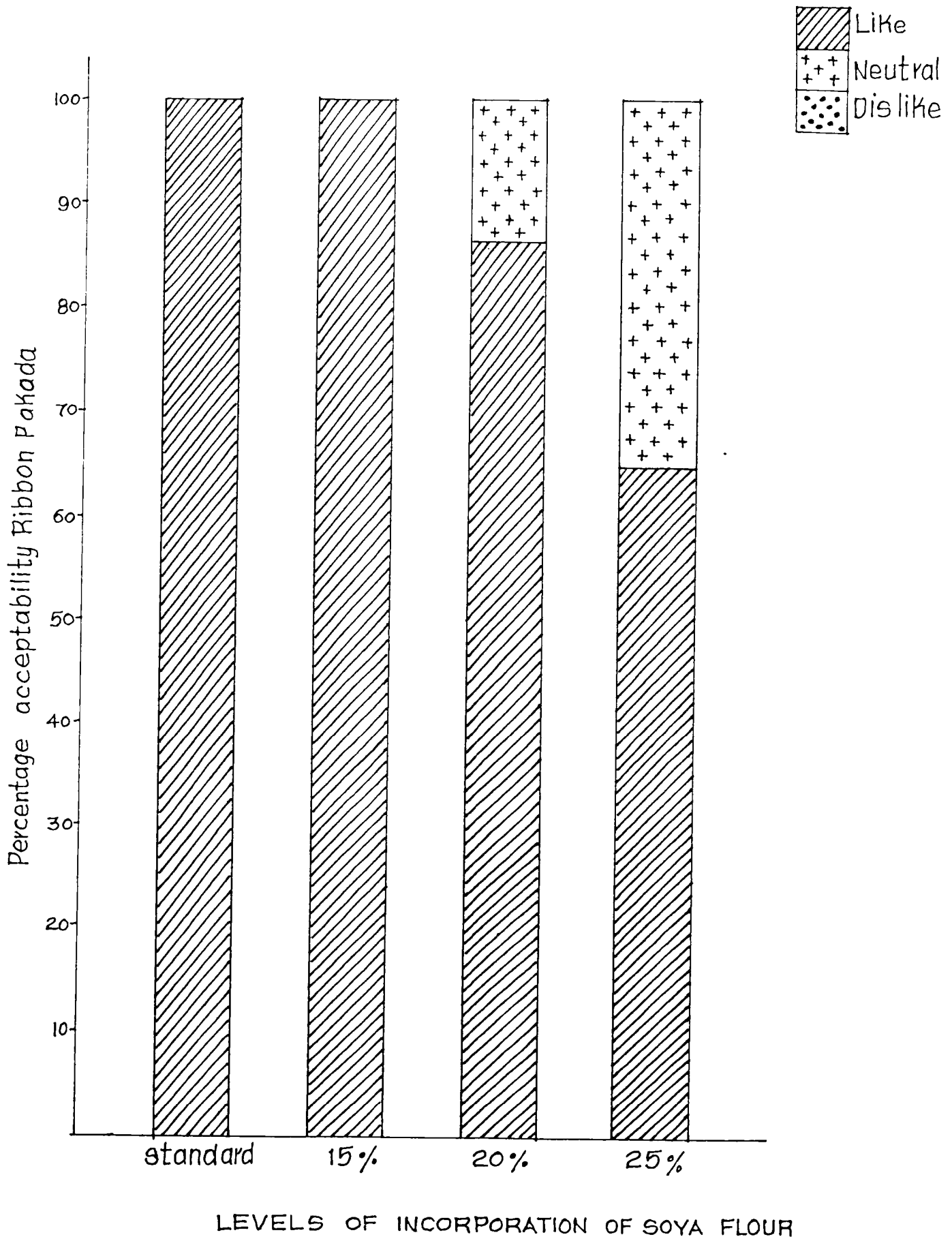
| Product -III<br>with different<br>composition | Attributes (Percent) |         |         |
|---|----------------------|---------|---------|
|   | Like                 | Neutral | Dislike |
| Standard                                      | 100                  | -       | -       |
| 15 %  | 100                  | -       | -       |
| 20 %  | 86.67                | 13.34   | -       |
| 25 %  | 65                   | 35.00   | -       |

Table X shows the percentage acceptability scores obtained for Ribbon Pakoda which was the third product. For the standard product all the children that is 100 percent liked the product. At 15 percent level of incorporation of Soya flour again, 100 percent liked, the product.

At 20 percent level of incorporation of soya flour 86.67 percent liked the product while 13.34 percent had a neutral attitude. At 25 percent level

Figure 5

# ACCEPTABILITY OF RIBBON PAKODA AT VARIOUS LEVELS OF SOYA FLOUR INCORPORATION



of incorporation 65 percent liked the product while 35 percent had a neutral attitude. None of the selected children said that they disliked the product. Though acceptability decreased with increase in Soya flour.

PRODUCT IV

DIAMOND CUTS (SWEET)

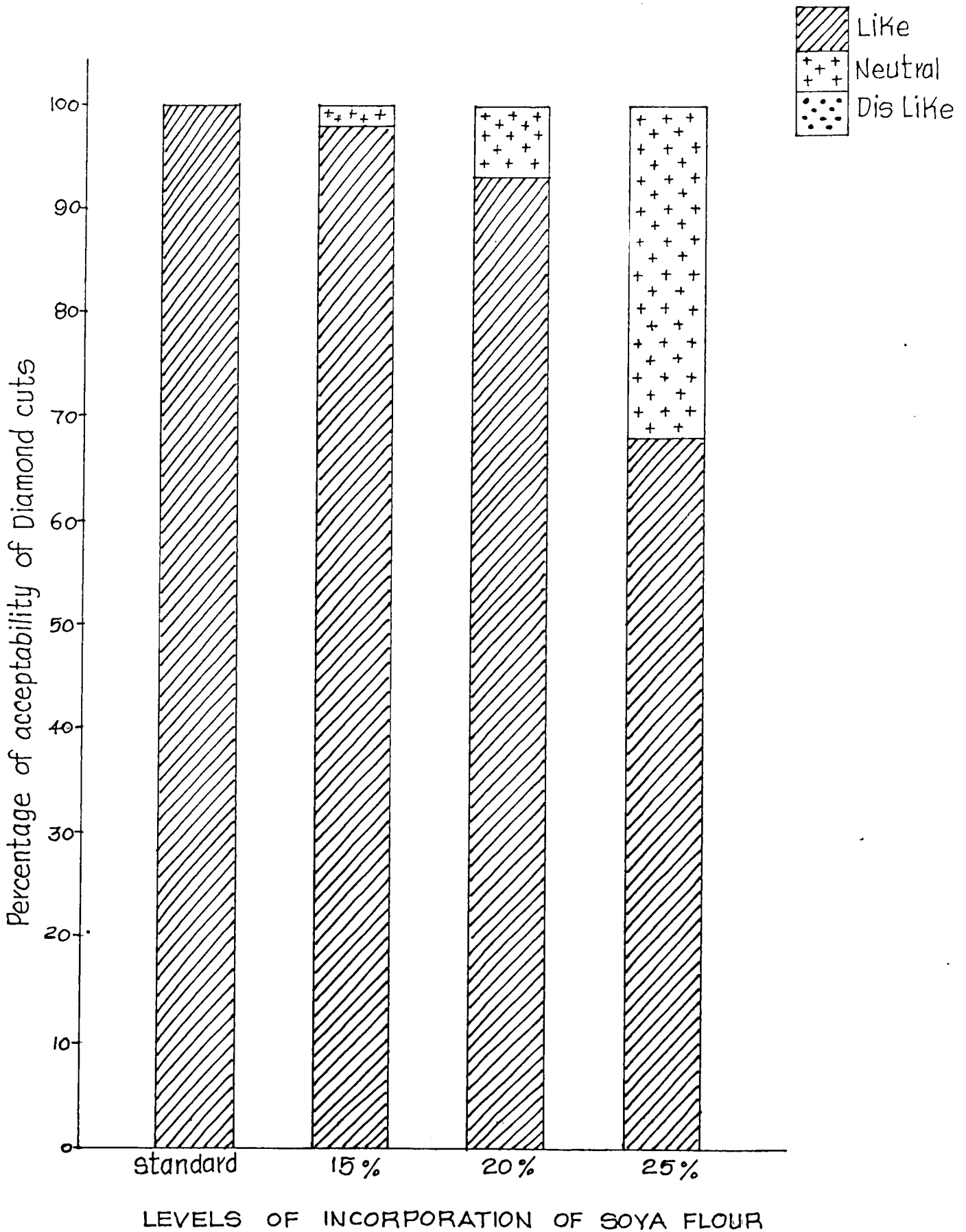
Table -IX Percentage acceptability of Diamond Cuts by the selected pre-school children.

| Product -IV<br>with different<br>composition | Attributes (Percent) |         |         |
|--|----------------------|---------|---------|
|  | Like                 | Neutral | Dislike |
| Standard                                     | 100                  | -       | -       |
| 15 %   | 98.84                | 1.66    | -       |
| 20 %   | 93.34                | 6.66    | -       |
| 25 %   | 68.34                | 31.66   | -       |

Table XI depicts the percentage acceptability of diamond cuts by the children, 100 percent accepted the standard product all the children said that they liked the product at 15 percent level of soya flour

Figure. 4

### ACCEPTABILITY OF DIAMOND CUTS AT VARIOUS LEVELS OF SOYA FLOUR INCORPORATION



incorporation 98.34 percent liked the product while 1.66 had a neutral attitude. At 20 percent level of soya flour incorporation 93.34 percent liked the product while 6.66 percent had a neutral attitude.

At 25 percent level of soya flour incorporation 68.84 percent liked the product while 31.66 percent had a neutral attitude. Even for this product acceptability decreased as the level of soya flour incorporation increased.

TABLE - X

Mean Acceptability Scores obtained for all the four selected products

| Product with various composition | Attributes |         |         |
|----------------------------------|------------|---------|---------|
|                                  | Like       | Neutral | Dislike |
| Standard                         | 97.92      | 2.08    | -       |
| 15%                              | 78.75      | 20.83   | 0.42    |
| 20 #                             | 73.73      | 25.42   | 0.85    |
| 25 %                             | 47.50      | 45.42   | 7.08    |

The mean acceptability scores of all the products prepared for this study at various levels of soya flour incorporation was studied. The above table gives the mean scores calculated.

For all the four standard products, 97.92 percent liked them while 2.08 percent had a neutral attitude. The products with 15 percent soya flour incorporation was liked by 78.75 percent, 20.83 percent had a neutral attitude while 0.42 percent disliked the product.

At 20 % percent level of soya flour incorporation 73.73 percent liked the product 25.42 percent had a neutral attitude & 0.85 percent disliked the product. At 25 percent level of soya flour incorporation. Only 47.50 percent liked the product, 45.42 had neutral attitude while 7.08 percent disliked them.

From the above table it may be seen that acceptability decreases as soya flour concentration is increased. The percent of dislike increases gradually from 15 percent level onwards.

The best accepted products were III & IV Ribbon Pakoda & Diamond cuts. The products 15 percent level of incorporation was quite popular followed by 20 percent level of soya flour incorporated products. The least

accepted ones were the products with 25 percent incorporation of soya flour.

A comparison between the acceptability of products by the panel members and the pre-schoolers reveal that the children accepted all products with various levels of soya flour incorporation. There was lower acceptability in the products with soya flour incorporation among the panel members.

D. COMPARITIVE STORAGE STUDY OF THE FLOURS USED:

1. ACID VALUE:

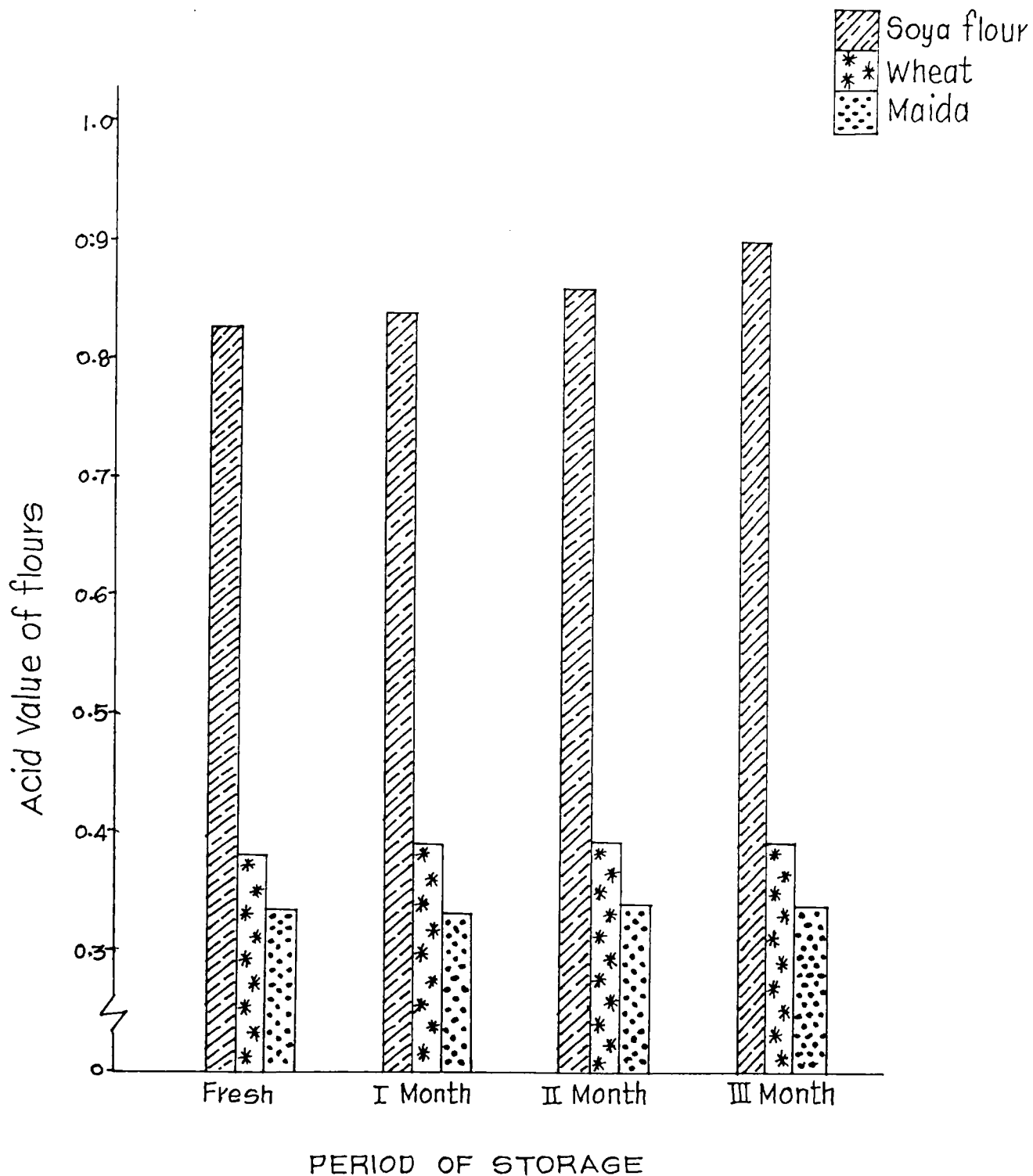
TABLE XI Acid value of the flour used in the recipes.

| Various flours | Acid value |         |          |           |
|----------------|------------|---------|----------|-----------|
|                | Fresh      | I month | II month | III month |
| Soya flour     | 0.830      | 0.839   | 0.858    | 0.901     |
| Wheat flour    | 0.387      | 0.387   | 0.392    | 0.396     |
| Maida flour    | 0.343      | 0.343   | 0.349    | 0.349     |

The Storage study of the three flours show a mean acid value for soya flour to be  $0.856 \pm 0.03$  percent oleic acid, and for wheat to be  $0.891 \pm 0.003$  percent Oleic acid. Maida flour had a mean value of  $0.346 \pm 0.003$ . Soya flour had the highest acid value due to the higher content of fat in the full fat flour.

Figure. 5

### ACID VALUE OF THE FLOURS



The acid value of soya flour increased at a greater rate on storage than the other two flours thus soya flour is very susceptible to rancidity on storage

## 2. PER-OXIDE VALUE;

TABLE XII Per-Oxide value of the flours used in the recipes

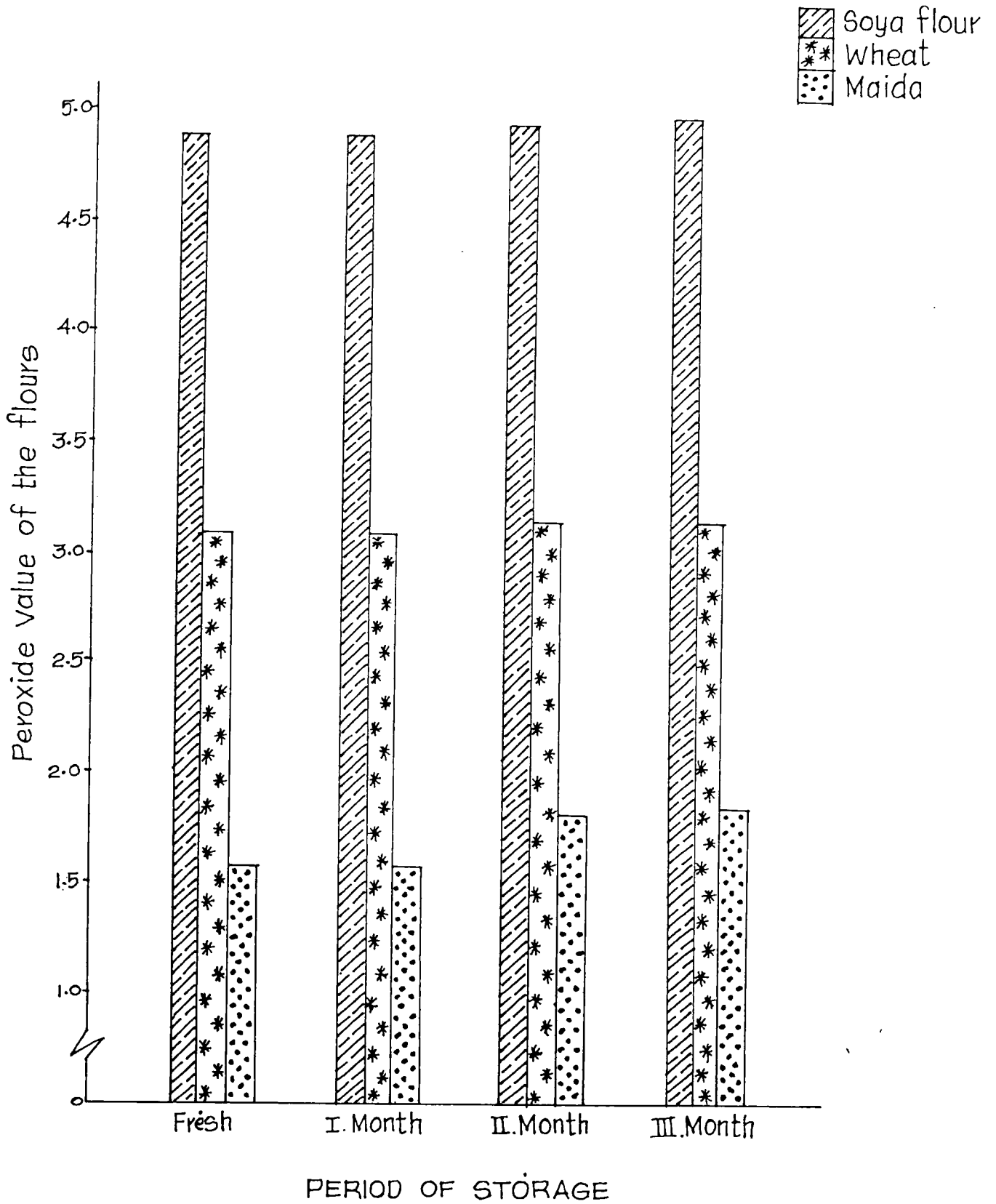
| Various flours | Per-Oxide value |         |          |           |
|----------------|-----------------|---------|----------|-----------|
|                | Fresh           | I month | II month | III month |
| Soya flour     | 4.73            | 4.73    | 4.89     | 4.97      |
| Wheat flour    | 3.18            | 3.18    | 3.25     | 3.25      |
| Maida flour    | 1.13            | 1.13    | 1.58     | 1.63      |

The above table gives the per-oxide values obtained for the three flours. The mean per-oxide value for soya flour is  $4.83 \pm 0.12$  & is higher than wheat or Maida flours. The mean per oxide value of wheat flour is  $3.215 \pm 0.04$  & the mean value for Maida flour is  $1.36 \pm 0.27$ . The rate of increase of per-oxide value in soya flour is faster than the other two flours.

Full fat soya flour has a high concentration of unsaturated fats and they get oxidised on storage. Maida flour & wheat flour has a lower amount of fat content than full fat soya flour so the per-oxide

Figure.6

PEROXIDE VALUES OF THE FLOURS



value is higher for soya flours as the per-oxide value increases soya flour turns rancid in a shorter time.

### 3. MOISTURE PERCENT:

Table -XIII Moisture percent of the flours used in the recipes.

| Various flours | Moisture percent |         |          |           |
|----------------|------------------|---------|----------|-----------|
|                | Fresh            | I month | II month | III month |
| Soya flour     | 6.24             | 7.0     | 7.5      | 7.8       |
| Wheat flour    | 7.30             | 7.30    | 7.51     | 7.54      |
| Maida flour    | 7.25             | 7.30    | 7.40     | 7.45      |

The storage study reveals that, of the three flour\$ wheat flour had the highest moisture content and the mean value for the 3 month period being  $7.41 \pm 0.13$ . Maida flour came second with a mean value of  $7.35 \pm 0.09$ . Soya flour had the least mean value of  $7.135 \pm 0.68$  during the storage period.

But at the end of the third month soya flour had a highest moisture content of 7.8 percent.

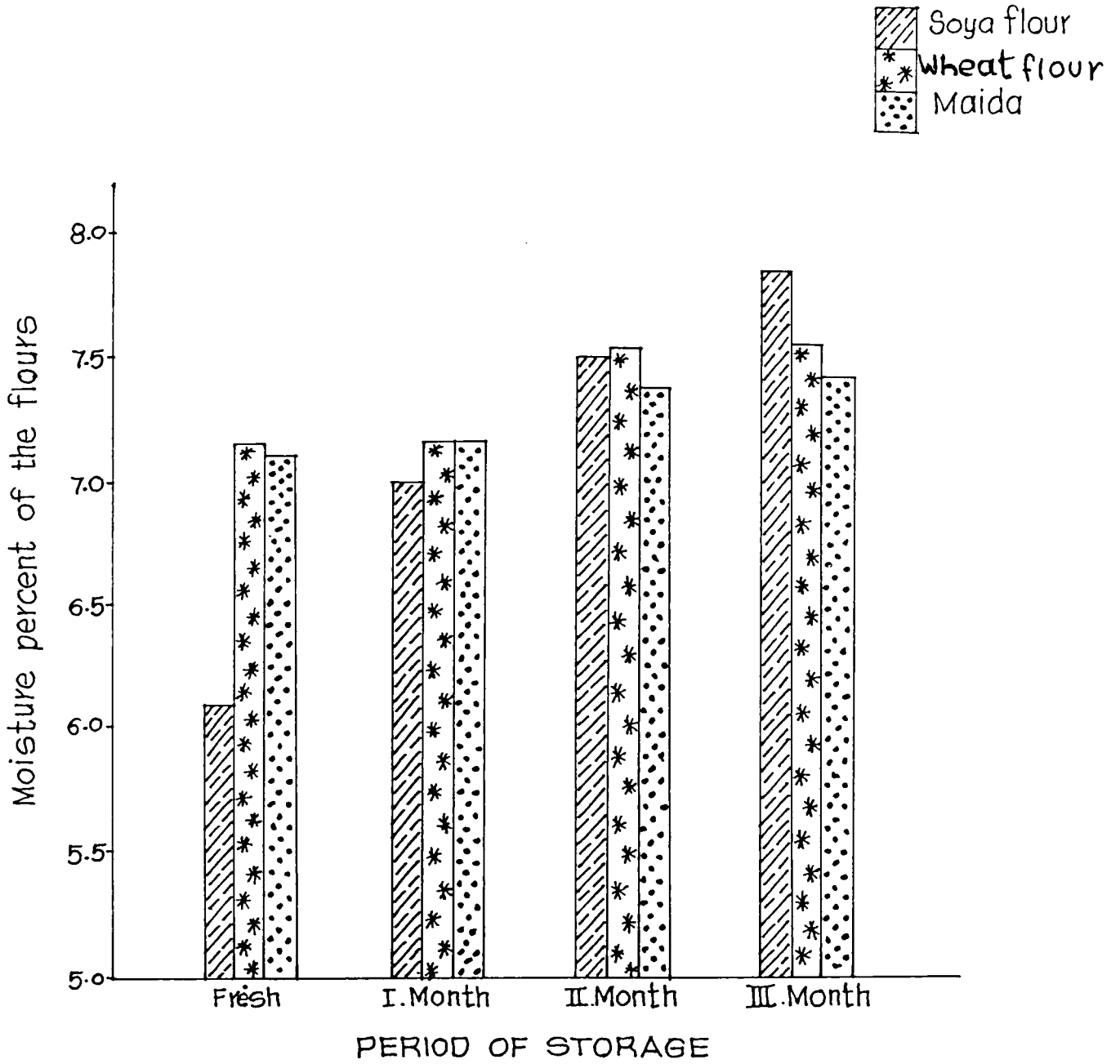
Soya flour has a tendency to have a higher moisture content on storage for a longer period. this moisture in the flour could lead to degradation in the quality of soya flour.

Thus soya flour & the other two flours could be stored without deterioration in quality for a period of 3 months under proper storage conditions. thus they can be utilized for supplementing the school lunch programme by storing the flours under proper condition.

The storage study conducted for 3 months is inadequate and studies should be done for a longer time to get the actual picture.

Figure: 7

MOISTURE PERCENT OF THE FLOURS



## Summary and Conclusion

SUMMARY AND CONCLUSION

Children are the greatest resource for the future development of our country. The Indian population has 21 percent of children in the pre-school age and they are the most neglected segment of population from the nutritional stand point. Majority of the Indian children are from low income groups where malnutrition is wide spread due to poverty. Protein Calorie malnutrition is the major nutritional problem seen in these children.

Soyabean having a high protein and calorie content was thus chosen for preparing low cost nutritious snacks for the pre-school children in an attempt to solve this protein energy gap and also with a hope of introducing these soya based items in the school lunch programme .

Sixty pre-school children coming under the I C D S programme were selected for the study, to find out the acceptability of recipes incorporated with various levels of full fat soya flour.

Acceptability trials were done as Soya is quite uncommon in the Indian diets and also because soya flour has a characteristic beany flavor.

A socio-economic study was done on the selected preschool children. The heights and weights were also taken. The survey showed that all these children came under the low income group and only a few of the total subjects met with the recommended heights and weights given by the I C M R.

The Nutrient intake of the children were also calculated using the 3 day weighment method. This was also much below that of the recommended allowances. The main meal for all the children came from the school lunch programme & the home diets were very poor with only cereals being consumed by them.

Acceptability trials were done first on a panel of 10 adult judges before giving the preparations to the children. This showed a variance in acceptability as most of them seemed to be biased about soya based preparations.

A trial was done before the actual testing was done on the children. so that they could be familiarised with the procedure and the products. The results of all the four recipes given to children show that majority of the children accepted best 15 % level of soya flour incorporation followed by 20 percent level and 25 percent level was the least accepted.

This decrease in the acceptability was due to the increase in beany flavor at higher levels of incorporation. Even then the children can be given 15 and 20 percent levels of soya incorporated foods for high protein and high calorie content.

Since good Nutritional status in the pre-school age determines good health in adult life, it is essential that this high protein source soya flour, be incorporated in their diets especially children belonging to the lower socio-economic strata.

Another factor as to why soya flour should be emphasised at the pre-school age is that the children can get better acquainted with the beany taste than adults.

If the beany flavor could be masked or removed higher percentage of the flour could be used so that the children can get the required recommended allowance of protein and energy per day in the school lunch programme.

Similar studies can be under taken to find acceptability of soya based products on various recipes which are commonly used & feeding trials in acceptability can be conducted for a longer period for fruitful results before introducing them in the diets of pre-school children.

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## Appendix

APPENDIX - 1

SCHEDULE FOR SOCIO-ECONOMIC AND DIETARY SURVEY

1. Name of the child :
2. Age :
3. Sex :
4. Occupation of the Head  
of the family :
5. Total monthly income :
6. Composition of the  
family :
  - a) Type : Joint/Nuclear
  - b) Religion and Caste
  - c) Vegetarian / Non-Vegetarian
7. Height of the child :
8. Weight of the child :
9. Daily meal pattern

---

| Days | On Rising | Breakfast | Midmorning | Lunch | Tea | Dinner |
|------|-----------|-----------|------------|-------|-----|--------|
|------|-----------|-----------|------------|-------|-----|--------|

---

Ist day

II day

III day

---

WEIGHMENT SURVEY

DAY :

---

| Meal      | Menu | Amount of Food consumed |                  |                   | Remarks<br>Wt. |
|-----------|------|-------------------------|------------------|-------------------|----------------|
|           |      | Quantity<br>served      | Quantity<br>left | Quantity<br>eaten |                |
| Breakfast |      |                         |                  |                   |                |
| Lunch     |      |                         |                  |                   |                |
| Tea       |      |                         |                  |                   |                |
| Dinner    |      |                         |                  |                   |                |

---

APPENDIX - II  
STANDARDISED RECIPES

RECIPE - 1 - (BISCUIT-SWEET)

Ingredients:

|                 |   |   |
|-----------------|---|---|
| Maida           | - | 100 g                                     |
| Soya flour      | - | as per the percentage of<br>incorporation |
| Baking powder   | - | 1 g                                       |
| Dalda           | - | 30 g                                      |
| Sugar           | - | 30 g                                      |
| Vanilla essence | - | 1 drop g                                  |

METHOD:

Cream sugar and dalda, add baking powder and Vanilla essence to it and then mix in Maida. knead to form a stiff dough divide the dough into two parts and roll into sheets. cut biscuits into shape with biscuit cutter. Place them on a greased tray bake at 325° F for 5 minutes.

VARIATION:

Maida flour was substituted with 15, 20 & 25 gms of soya flour keeping the total amount of flour to 100 gms.

Nutrient Content:

Calories - 750 K.Cal, Protein - 18 gms, Fat - 33 gms.

## RECIPE - 2 - - HOT BISCUITS:

### INGREDIENTS;

|               |   |  |
|---------------|---|--|
| <u>Maida</u>  | - | <u>100 g</u>                           |
| Soya flour    | - | as per the percentage of incorporation |
| Baking powder | - | 1 g                                    |
| Dalda         | - | 30 g                                   |
| Chilli powder | - | 5 g                                    |
| Sugar         | - | 30 g                                   |

### Method:

Cream sugar and dalda. - Add baking powder to the mixture and then mix in Maida. Knead to form a stiff dough. Divide the dough into sheets. Cut biscuits into shape with biscuit cutter. Place them on a greased tray bake at 325°F for 5 minutes.

### Variations:

Maida flour was substituted with 15,20 and 25 gms of soya flour keeping the total amount of flour to 100 gms.

### Nutrient Content;

Calories - 750 K.Cal<sup>1</sup>. Proteins - 18 gms. Fat - 33 gms.

### RECIPE 3 RIBBON PAKODA

#### Ingredients:

|                |   |  |
|----------------|---|--|
| Wheat flour    | - | 100 g                                  |
| Soya flour     | - | per the percentage of<br>incorporation |
| Fat for batter | - | 5 g                                    |
| Chilli powder  | - | 5 g                                    |
| Ground nut     | - | 10 g                                   |
| Turmeric       | - | 1 g                                    |
| Salt           | - | 8 g                                    |
| Oil            | - | 20 for frying                          |

#### METHOD:

Rub fat into the flour. Mix salt and chilli powder and slightly powdered groundnuts, add it along with turmeric to the flour. Add water and knead it to a stiff dough roll into sheets and cut into ribbons with a knife. Deep fat fry in oil.

#### Variations:

Wheat flour was substituted with 15,20 and 25 gms of soya flour keeping the total flour amount to 100 gms.

#### Nutrient content:

Calories - 740 K.Cal. Proteins - 15 g , Fat - 32 g.

## RECIPE 4

DIAMOND CUTSIngredients:

|                |   |  |
|----------------|---|--|
| Wheat flour    | - | 100 g                                      |
| Soya flour     | - | as per the percentage of<br>incorporation. |
| Fat for butter | - | 5 g  |
| Sugar          | - | 30 g                                       |
| Cooking soda   | - | 1 g  |
| Oil for frying |   |  |

Method:

Rub fat into the flour. Knead into a stiff dough roll into sheets and cut in diamond squares. Fry in oil.

Make a thick sugar syrup and put the fried square into it dry them on a big plate for some time.

Variations:

Wheat flour was substituted with 15 20 & 25 gms of soya flour, keeping the total flour amount to 100 gms

Nutrient Content:

Calories - 750 K.Cal. Proteins - 15 g Fat - 32 gs.

Appendix III

A.

Score Card

Date \_\_\_\_\_

Name \_\_\_\_\_

| <u>Points</u> | <u>Scores</u> | <u>Quality</u> |
|---------------|---------------|----------------|
| 5             | -             | Very good      |
| 4             | -             | Good           |
| 3             | -             | Fair           |
| 2             | -             | Poor           |
| 1             | -             | Very Poor      |

Directions

1. Place the numerical score in the box (in upper left hand corner)
2. Comments should justify the numerical score & be brief
3. Evaluation should be on individual basis

Products




| Quality characteristic   | Standard | 15% | 20% | 25% |
|--------------------------|----------|-----|-----|-----|
| 1. Appearance            |          |     |     |     |
| 2. Texture               |          |     |     |     |
| 3. Aroma                 |          |     |     |     |
| 4. After taste           |          |     |     |     |
| 5. Overall acceptability |          |     |     |     |

B. SCHEDULE FOR PRESCHOOLERS

NAME \_\_\_\_\_

DATE \_\_\_\_\_

NAME OF THE PRODUCT

|              |  | Standard | 15 % | 20 % | 25 % |
|--------------|--|----------|------|------|------|
| I like it    |   |          |      |      |      |
| Neutral      |   |          |      |      |      |
| I dislike it |  |          |      |      |      |

## Appendix IV

MEAN NUTRIENT INTAKE PER DAY OF THE SELECTED  
CHILDREN

| SERIAL<br>NUMBER | PROTEIN<br>(g) | FAT<br>(g) | CALORIES<br>(K.Cal) |
|------------------|----------------|------------|---------------------|
| 1                | 14.5           | 12.6       | 739                 |
| 2                | 16.0           | 12.6       | 734                 |
| 3                | 16.0           | 11.3       | 708                 |
| 4                | 14.3           | 13.3       | 655                 |
| 5                | 18.0           | 17.3       | 884                 |
| 6                | 14.6           | 12.6       | 739                 |
| 7                | 16.2           | 12.6       | 748                 |
| 8                | 20.5           | 15.3       | 931                 |
| 9                | 14.8           | 14.0       | 733                 |
| 10               | 14.5           | 17.3       | 730                 |
| 11               | 18.4           | 19.3       | 825                 |
| 12               | 18.4           | 17.3       | 946                 |
| 13               | 15.5           | 14.0       | 726                 |
| 14               | 18.0           | 24.0       | 944                 |
| 15               | 14.6           | 22.6       | 842                 |
| 16               | 19.7           | 13.34      | 903                 |
| 17               | 18.3           | 22.6       | 1007                |
| 18               | 15.3           | 14.8       | 855                 |
| 19               | 15.5           | 20.6       | 831                 |
| 20               | 18.2           | 24.0       | 943                 |

| SERIAL<br>NUMBER | PROTEIN<br>(g) | FAT<br>(g) | CALORIES<br>(K.cal) |
|------------------|----------------|------------|---------------------|
| 21               | 14.6           | 22.6       | 916                 |
| 22               | 19.7           | 20.0       | 961                 |
| 23               | 17.1           | 26.0       | 1047                |
| 24               | 15.3           | 20.0       | 863                 |
| 25               | 15.5           | 20.6       | 830                 |
| 26               | 18.4           | 20.6       | 975                 |
| 27               | 18.0           | 20.6       | 856                 |
| 28               | 14.6           | 24.0       | 948                 |
| 29               | 19.7           | 22.6       | 895                 |
| 30               | 15.5           | 13.3       | 917                 |
| 31               | 18.3           | 22.6       | 1009                |
| 32               | 15.5           | 20.6       | 856                 |
| 33               | 18.0           | 24.0       | 944                 |
| 34               | 14.6           | 22.6       | 920                 |
| 35               | 19.7           | 20.0       | 1014                |
| 36               | 15.4           | 20.0       | 872                 |
| 37               | 17.7           | 23.6       | 970                 |
| 38               | 15.8           | 22.6       | 922                 |
| 39               | 15.4           | 15.8       | 874                 |
| 40               | 18.0           | 20.6       | 977                 |
| 41               | 14.5           | 19.3       | 790                 |

| SERIAL<br>NUMBER | PROTEIN<br>(g) | FAT<br>(g) | CALORIES<br>(K.Cal) |
|------------------|----------------|------------|---------------------|
| 42               | 16.4           | 15.5       | 872                 |
| 43               | 18.0           | 17.3       | 884                 |
| 44               | 14.8           | 12.6       | 739                 |
| 45               | 16.2           | 12.6       | 748                 |
| 46               | 20.5           | 15.3       | 854                 |
| 47               | 14.8           | 14.0       | 733                 |
| 48               | 18.0           | 17.3       | 912                 |
| 49               | 12.9           | 19.3       | 832                 |
| 50               | 15.6           | 18.8       | 906                 |
| 51               | 14.4           | 15.3       | 896                 |
| 52               | 17.8           | 19.4       | 880                 |
| 53               | 13.8           | 13.3       | 833                 |
| 54               | 12.8           | 12.13      | 688                 |
| 55               | 12.6           | 15.7       | 740                 |
| 56               | 14.2           | 14.1       | 729                 |
| 57               | 14.1           | 14.3       | 738                 |
| 58               | 16.1           | 13.6       | 844                 |
| 59               | 15.2           | 15.0       | 712                 |
| 60               | 12.3           | 13.9       | 625                 |
| MEAN             | 16.5           | 15.38      | 849.0               |
|                  | $\pm 2.65$     | $\pm 6.25$ | $\pm 99.25$         |