

Assessing the Nutrient Content
of Selected South Indian
Breakfast Items

BY

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A THESIS SUBMITTED TO THE AVINASHILINGAM INSTITUTE FOR HOME SCIENCE
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IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF
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SELECTED SOUTH INDIAN BREAKFAST ITEMS

By

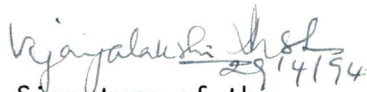
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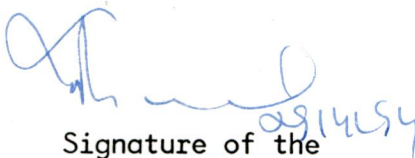
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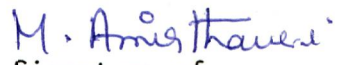
IN PARTIAL FULFILMENT OF REQUIREMENTS
FOR THE DEGREE OF
MASTER OF SCIENCE
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APRIL, 1994

CERTIFIED AS BONAFIDE RESEARCH WORK


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Head of the
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the
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KITCHIDI

Introduction

INTRODUCTION

Life cannot be sustained without adequate nourishment. Man needs adequate food for growth, development and to lead an active and healthy life.

Food stuffs may be broadly classified as cereals, pulses, nuts and oil seeds, vegetables, fruits, milk and milk products and flesh foods. These foods contain substances known as nutrients, and it is for obtaining these nutrients which perform various functions in the body that food is consumed daily - the nutrients included proteins, fat, carbohydrate, vitamins and mineral salts. Man needs all the above nutrients in different amounts to grow, live and thrive. Since man derives all the nutrients he needs through the diet he eats, his diet must be well balanced to provide all the nutrients in proper proportions.

Food should be nutritious attractive in flavour and appearance if it is to be eaten and enjoyed. In other words it must stimulate the appetite. For most people dining and eating are among the enjoyments of life to be enjoyed food must be of good eating quality of palatability. That the surroundings play a part is evidenced by experiments recently carried out in an American

University involving medical students in which it was shown that the flow of digestive juices from the stomach is improved when the surrounding and services are pleasing (Birch et al, 1986).

Proteins provide energy, their primary function is to provide amino acids for building body proteins. Fats particularly oils, besides being a concentrated source of energy, provide essential fatty acids which have vitamin like function in the body together with water which is also an essential element, the proximate principles from bulk of the diet. Fibre which are undigestible complex molecules also contribute to the bulk and have some useful function in the digestive tract. Vitamins and minerals play an important role in the regulation of the metabolic activity in the body. Minerals are used for the formation of body structure and skeleton.

The importance and awareness of nutrition in public health issues has resulted in increased demands for knowledge of the nutrient count of foods. This knowledge is required by scientists conducting research in such areas as nutrition, food science, clinical chemistry and epidemiology. Dietitians and other professionals responsible for formulating diets are requesting detailed

information about the nutrient content of foods. Quantification of all of the nutrients important to human health in all of the available food is an overwhelming if not impossible task.

'Breakfast' break the 'fast' of the night, and offers a nutritious and healthy start to the day. After 8 or 10 hours without food, body's systems have showed right down and don't pick up until something is eaten. In the morning the body is in need of nourishment more than at any of other time of the day. Energy must be renewed, and the body tissues must be furnished with nutrients for their special functions as your body is put into motion for the day.

A proper breakfast will furnish all of this, but if you have no breakfast or only a skimpy one, your body must draw upon its reserves, which should be left for emergencies. The body depends upon a daily supply of most nutrients. If there is a lack of these important materials, there may be lessened energy headache, excessive fatigue even dizziness certainly a lower plane of physical, mental and emotional performance.

Whole some breakfast is very important in terms of supplying a good balance of the days nutrients.

Nutritionists recommended that breakfast should supply one third of an individuals daily needs for essential nutrients and energy. A breakfast meal should be nutritious. A balance of nutrients may be obtained by including whole grain cereal, milk and an adequate milk alternative, such a breakfast provides a large proportion of our needs for energy, complex carbohydrates, protein, dietary fibre and many vitamins and minerals.

A good breakfast doesn't have to be time-consuming or loaded with excess kilojoules. A nutritious, delicious breakfast supplies with the energy. It is the vital meal of the day for every one in the family. The determination of nutrients in foods is a complex process requiring decisions at several steps (Nutrition Education Service, 1992).

The nutritive value of any food stuff should be assessed on the cooked material not in its raw state (Gopalan et al, 1989). Nutrients selected for analysis should be associated with public health problems, there should be lack of adequate analytical data, and accurate and precise analytical procedures, including extraction and preparation schemes, need to be developed before analysis of nutrients in food can proceed. The analysis of nutrients in those foods for which data are sparse should concentrate on

frequently consumed foods that have been prepared by customary procedures, those foods that contribute large amounts (or concentrations) should be the first priority. Compilation of accurate and precise nutrient data bases will permit health professionals to accurately assess nutrient intake and utilization and to improve human health through nutrition education and or therapy (Becheretal 1984).

Analysis of food is carried out essentially to find out what it contains, what are its physical properties and what condition it is in. These tasks are made difficult by the fact that foods are very complex, minutes of thousands of chemical substances and widely differing chemical and physical properties. However, the great majority of the chemical constituent of food can be grouped together on the basis of their properties and behaviour when analysed by a few basic test methods. These groups of substances, known as the proximate components are moisture, protein, fat and mineral matter. Moisture content is determined by drying, protein by determination of the nitrogen content of the food, fat by solvent extractions and mineral matter by ashing the food stuffs to remove the organic matter (Rumarac et al, 1993). Within recent years the growing concern regarding the ability of the world to nourish its ever-increasing population has kindled a keen awareness regarding the nutritional value of foods. As a consequence, a concerted effort is being made by the

industrial, governmental and academic communities to gain more knowledge about the nutritional quality of our food supply and to promulgate these information in a precise and meaningful manner to the consumer through nutrition labelling.

In satisfying this need, the food scientist has as his primary responsibility the task of developing information regarding the nutritional composition of specific foods. The ubiquitous nature of many of the nutrients, their presence in trace amounts their susceptibility to further reaction and change and the wide variety of food types requiring composing, blending and analysis are just few of the problems confronting the analyst in the work (Hary and Lento, 1986).

Over the last two decades considerable progress has been made in improving the speed, accuracy and precision of food analysis. The chance is only as strong as its weakest link and still critical to any analytical chain is the preparation of the sample received prior to the analytical determination (Lento, 1986).

By keeping all these points in mind the investigator had interested in doing this study on "Assessing the Nutrient Content of Selected South Indian

Breakfast items" with the following aims and objectives :

1. To choose the common breakfast items
2. To standardise the selected breakfast items
3. To calculate and analyse the nutrient content of the selected items, and
4. To produce a ready reckoner to show the nutrient content of the selected breakfast items.

Review of Literature

REVIEW OF LITERATURE

Review of literature pertaining to the topic "Assessing the Nutrient content of selected South Indian Breakfast Preparations" is discussed under the following headings :

1. Impact of food intake on Health
2. Importance of Breakfast consumption
3. Role of cereals and pulses in breakfast preparations
4. Standardisation and sensory analysis of foods
5. Nutrient analysis of the cooked items.

1. Impact of food intake on Health

Williams, (1992) expressed that food has always been one of the necessities of life. Many people, however, are concerned only with food that relieves their hunger or satisfies their appetites but are not, concerned about whether it supplies their bodies with all the components of good nutrition.

Good food and key nutrients promote health by making possible the normal operation and maintenance of the body. No matter how different people are in size,

appearance, activity, race or age, they all need the same nutrients protein, fat, carbohydrate, vitamins, minerals and water. As long as these nutrients are digested and absorbed, they can provide fuel for physical activity such as walking and for a multitude of less obvious functions such as breathing, maintaining muscle tone, circulating the blood and digesting food. Each of these nutrients serves functions in the body in addition to providing energy (Carol et al., 1989).

Health is the greatest asset in life and good nutrition is the foundation for health. Any investment as Devadas (1987) points out toward improving the nutritional status of an individual is an investment for the wealth of the nation.

Phillips (1983) states that foods is sources of nutrients. All of the nutrients needed by the body are available from the food we eat. So in addition to establishing the amounts of the individual nutrients that human need, nutrition scientists also are concerned with finding out where we get the nutrients, that is, in learning what foods contain what nutrients and in what amounts. This information is needed for developing recommendations for foods and diets that will provide good nutrition.

According to RajaGopal (1990) that food has been a basic part of our existence. Through the centuries we have acquired a wealth of information about the use of food as a part of our community, social, cultural and religious life. It has been used as an expression of love, friendship and social acceptance. It is also used as a symbol of happiness at certain events in life.

Norman (1986) opines that food is an absolute need, our every source food should contain the building blocks we need to grow and to repair tissues. Food should contain the nutrients we need to regulate our body systems.

Birch (1984) states that people use the word food they can, as with so many other words in the English language, mean all sorts of different things the primitive tribesman uses his word "food" for a few similar substances such as flesh, fruits or roots which satisfy his pangs of hunger when he eats them scientifically food is defined as that which is necessary for the health, growth and normal functions of living organisms. Lewis (1986) states that food can be used to express feelings it can make us feel secure, loved and cared for. Food can remind us of pleasant experiences or unpleasant ones. Food is used as a means of sharing happy occasions with other and as a source of comfort.

Devadas (1980) states that the science of nutrition, which is relatively new discipline, deals with the relationships between man and his food. It is the study of the constituents and functions of food, and the many ways in which they interact in the human body and influence the personality of man.

Saxelby (1987) states that your body requires six essential nutrients for health and growth-carbohydrates, fibre, protein, fats, vitamins, minerals and water. Your body cannot do without these nutrients. All food, however different in taste and appearance can give us some or all of these six nutrients.

Buss (1982) opines that food is any solid or liquid which when swallowed can supply any of the following:

- a. Material from which the body can produce movement, heat or other forms of energy
- b. Material for growth, repair or reproduction
- c. Substances necessary to regulate the production of energy or the processes of growth and repair.

NIN (1990) reveals that food are eat, play an important role in maintaining good health. We have many foods to choose from and the health of an individual depends upon the type and quality of foods he chooses to eat. Foods

are made up of substances called nutrients. These nutrients are proteins, carbohydrates, fats, minerals and vitamins. They are present in most foods but in different amounts.

Ebrahim (1983) states that man needs food to provide energy for the body's essential physiological functions like respiration, circulation, digestion and metabolism; for maintaining body temperature, for the growth and repair of the body's tissues. For obtaining essential nutrients which perform key functions in the biochemical processes of metabolism.

Verner Whellock (1992) expresses that diet is a key factor in determining the health of an individual. It is well recognized that, in many countries, people eat too much fat, especially saturated fat, too much sugar and salt, but not enough dietary fibre. In the U.K. the recent Government White Paper has set targets for the population. These are

1. to reduce the total fat in the average British diet by 12 per cent between 1990 and 2005
2. to reduce the saturated fat in the average British diet by 35 per cent between 1990 and 2005.

While there is clear evidence that these are getting through to the individual. There are genuine difficulties above putting the recommendation into practice.

2. Importance of Breakfast Consumption

Some people skip breakfast because they say that they feel a greater hunger later in the morning after eating breakfast, than if they ate nothing at all. This probably stems from the fact that breakfast gets their metabolism going, but skipping breakfast leaves the body in a slower mode.

Many people concerned about their weight, skip breakfast with the mistaken idea that it will help them lose weight. They think that if they eat breakfast they will gain weight. But this is not true. In fact, eating a good breakfast will aid in the maintenance of appropriate weight because it will alleviate ravenous hunger throughout the day. If your energy level isn't replenished at breakfast, you can't function effectively. Your body will crave an energy boost, and you will experience that 'I must eat' crisis. This is where your resolve breaks down, and you reach for a snack. And too often, the snack is high in kilojoules, but low in nutrients. So it is these between-meal snacks, not breakfast, that most often result in excess weight.

Skipping meals, particularly breakfast, is not the answer to a long-term, healthy weight-reduction program. Be sensible about dieting. Instead, cut down on fats and sugars, and increase your use of whole-grain cereals. Be sure to always start the day with a breakfast

that supplies sound nutrition and lasting energy, and begin an exercise routine to help you burn off more kilojoules (Nutrition Education Service, 1992).

3. Role of cereals and pulses in breakfast preparation

Ali (1987), states that the average Indian diet consists primarily of cereals and pulses contributing to about 80 per cent of the total caloric intake a pulses which contribute to about 10 per cent of the food grain consumption are the major source of protein in the cereal based diet.

NES (1992) opines that whole grains and whole grain products provide most of our energy needs in the form of complex carbohydrates, plus fibre, some protein, vitamins -especially the B group vitamins and minerals.

Legumes are also known as pulses, are among the most valuable foods available for our consumption rich in protein complex carbohydrates, dietary fibre iron and calcium, they have been described as nutritional power houses. Legumes are nutritional wonders. One cup contains 840 to 1050 kilojoules, 14 to 20 grams of protein, an attractive 6 to 8 grams of fibre, less than 2 grams of fat, no cholesterol and whole horde of vitamins and minerals.

Cereal fibre (such as wheat fibre) increases the bulk of a meal and helps to maintain a healthy and regular bowel. Fibre foods give a feeling of 'fullness' and so can aid in weight loss.

According to Philip (1993) vegetables play an important role in the human diet. Properly chosen and eaten, cooked or raw, they make an invaluable contribution toward the supply of vitamins and minerals. Root vegetables are good sources of carbohydrates and pulses of vegetable proteins. A good balance of ingredients essential for growth and maintenance in human beings is more easily attained by a diet made up of both plant and animal life. Vegetables also provide variety in a meal, help to make a meal attractive by introducing colour and furnish roughage.

4. Standardisation and sensory Analysis of foods

Catherine Sullivan et al., (1990) evaluate a standardisation recipe as one that has been tested and adopted for use in particular facility. To develop, maintain and use a standardised recipe system requires time, effort and full co-operation. Palan et al., (1986) says that after a recipe has been tested and used many times with the same results, it becomes a standardised recipe for that operation.

Jellinck (1985) define sensory analysis of food relies upon evaluation through the use of our senses (odour, taste, tactile temperature etc.).

According to Birch et al., (1984) the term sensory methods is reserved here for a number of specialised techniques for dealing with different aspects of what are perceive, including its expression in numerical form, where relevant.

Approach to sensory evaluation is very dynamic. There is continual search for methodologies which could best fit varied problems related to product attributes. While it is accepted that analytical tests are necessary and worthwhile approaches to evaluation of product differences. For this reason the descriptive types of sensory tests were initiated and developed (Minoza, 1983).

Cameron et al., (1986) says that our appreciation of any experience depends upon its impact on our senses. The palatability of food may be judged on the basis of the kinds, quality and intensity of sensory impresses made. The most important sensory properties of food are flavour taste, appearance and texture. The act of food preparation, small or large scale is the art of skilful combination of these properties to please the eye, the nose and the palate.

Smith et al., (1993) states that sensory analysis or sensory evaluation is the study and measurement of a person's perception of a product or a person's response to a product. It is used to describe, differentiate and determine desirability of products. This information is critical to the development, maintenance and performance of most food products.

Dieter (1984), states that in research and development in the food industry, use of secondary evaluation panels are extremely useful. They are of three types: Highly trained experts, small laboratory panels, and large consumer groups. Where only two samples are being compared, paired duo-trio, or triangle tests are commonly used. Applications of these three classical tests are discussed in numerous publications.

Sensory analysis is the most widely used form of routine food quality evaluation. Traditionally sensory evaluation of a food includes taste, odour, texture and general appearances. These evaluations are mostly objective and depend entirely upon the examiners physical ability to discuss the attribute being evaluated (Piggott, 1984).

Hogg (1983), states that evaluation of the acceptability of food products in items 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 satisfaction.

5. Nutrient analysis of the cooked items

RamRoy (1983) states that the analysis of food and food products is one of the major concerns of modern analytical chemistry. In general food stuffs are analysed for the following purposes

1. To obtain nutritional and biochemical knowledge of food and food products
2. To check the incoming raw materials to ensure that they confirm to certain standards.

Macrae et al., (1993) states analysis of food is carried out essentially to find out that it contains, what are its physical properties and what condition it is in. These tasks are made difficult by the fact that foods are very complete mixtures of thousands of different chemical substances with widely differing chemical and physical properties.

Macrae et al., (1993) opines that reliable and valid food analysis depends on efficient laboratory

operation, suitable reagents, fully calibrated and maintained equipment and instruments and effective sampling and sample preparation.

Food analysis is an important branch of food science and technology and providing information on the quality and nutritional value of foods. New techniques are providing greater insight into the nature and composition of foods, and developments in instrumentation are providing the means for rapid and economical analysis.

Quality assurance systems, standardized methods and analytical quality control are important features of an efficient food analysis laboratory.

Methodology

METHODOLOGY

The methodology of the present study on "Assessing the Nutrient Content of Selected South Indian Preparations" consists of the following steps

1. Selection of the Venue
2. Selection of the recipes
3. Preparation and standardisation of common breakfast dishes
4. Calculation of the Nutrients for the selected breakfast items
5. Quantitative analysis of the selected nutrients
6. Comparison of calculated and analysed values

1. Selection of the venue

The investigator have selected the foods in Avinashilingam Deemed University for the standardisation of recipes because all the facilities are available in the lab to prepare, evaluate and standardise the recipes. All the nutrient analysis were done in the nutrition laboratory. It was very much convenient for the investigator to conduct the dissertation work in the same campus.

2. Selection of the recipes

Selection of the recipes were done by conducting survey among the randomly selected households, numbering 50. Interview method was used in order to obtain accurate data. An interview schedule was prepared for conducting the survey and a copy of that is given in Appendix-I. Various common breakfast items prepared by the families were noted. Items like Idli, Dosai, Chutney, Sambar, Poori Masal, Chappathi Vegetable kuruma, Wheat Uppuma and Kitchidi are the common preparations done for the breakfast. So these common South Indian preparations were used for the standardisation and nutrient analysis.

3. Preparation and standardisation of common breakfast dishes

Mixing various ingredients and preparation of the food items make the food palatable, acceptable and consumable. The preparation of nutritious and appealing food that will be enjoyed by all who eat it, is no small achievement. High quality food is not only satisfying to the appetite and to the aesthetic sense, it also plays an important role in good health. Food that is well prepared, perfectly flavoured and appropriately and attractively served is keenly anticipated and enjoyed (Pekham 1986). During the preparation of the selected breakfast items, the raw ingredients which have been used for the individual preparations were weighed accurately.

In the preparation of Idli, three variations were prepared by changing the proportion of black gram dhal. First variation was done with 150 g of rice and 50 g of black gram dhal and second variation by taking 200 g of rice and 50 g of black gram dhal and the third variation by using 250 g of rice and 50 g of black gram dhal. Same way the variations were done for the individual selected items. For the preparation of red gram dhal sambar, 25 grams of red gram dhal was taken as constant and variation in Tamarind pulp was done with 5 g, 10 g and 15 g respectively. For the preparation of chutney 50 g of grated coconut was taken as constant ingredient and variation of roasted bengal gram dhal, with 25, 30 and 35 g respectively were done.

For the preparation of Chappathi, the first variation was done by using 50 g of wheat flour and 50 g of maida flour and the second by taking 60 g of wheat flour and 50 g of maida flour, and the third variation was with 80 g of wheat flour and 20 g of maida flour. The above variations were also used for the preparation of Poori. In the preparation of mixed vegetable kuruma, vegetables like beans, carrot and potato were used. By changing the amount of coconut as 5 g, 10 g and 15 g, the kuruma was prepared. For the preparation of potato masal 50 g, 55 g and 60 g of potato was used along with other ingredients.

For the next item kitchidi, variations in wheat semolina and wheat vermicelli were done. First variation was done with equal proportion of about 30g : 30g, and second by using 30g of white semolina and 20 g of wheat vermicelli was prepared, and the third variation with 30 g of white semolina and 20 g of wheat vermicelli. For the preparation of wheat uppuma, wheat ravai was taken as constant by taking the variation in oil with 5g, 10g, 15g. For the preparation of pongal 25 g of raw rice (milled) was taken as constant and variation in green gram dhal with 10, 15, 20 g were prepared without changing the other ingredients.

The individual breakfast items were prepared and evaluated for three consecutive days to evolve standardised recipes. Breakfast items were prepared for 3 days with the same result it become a standard recipe (Palan et al., 1986). For each preparation volume of water used, soaking time, cooking time and the quantity, number of the prepared items, diameter (for example Idli) and the total cooked weight along with the number of serving were recorded. Sensory evaluation of the recipes were done with the help of five panel members selected from the P.G. Class. Score cards were prepared with three point scores for the evaluation. A model score card is given in Appendix II.

For every recipe the same panel members were called for and the recipes were judged properly. Acceptability of the food product was noted judged properly. Acceptability of food product was noted with the help of the scores given by the panel members. The recipe with minimum scores are highly acceptable by the panel members standardised recipe was used for the analysis of certain selected nutrients.

4. Calculation of the Nutrients for the selected breakfast items

Calculation of the nutrients were done for all the ingredient used for each breakfast items. The nutrients like energy, protein, fat, vitamin C, calcium, Iron and fibre were calculated by using the book "Nutritive value of Indian Foods" by National Institute of Nutrition, Hyderabad. For each breakfast items and with their proper combinations the above nutrients were calculated and the total nutrients present in each item were assessed.

5. Quantitative analysis of the selected nutrients

Quantitative analysis of cooked food was done to find out the nutrients present in breakfast items by using valid analytical procedures for reliable nutrient analysis of foods. If appropriate methods are used by values will probably be correct for nutritionally significant

levels of those nutrients listed as having adequate and substantial methodologies (Stewart, 1984). From the standardised breakfast recipes a sample was weighed and dried in the oven and the ashed sample was taken to find out the nutrient content of the items. Nutrients like energy, protein, fat, calcium, iron, vitamin C and fibre were estimated quantitatively by using analytical procedures.

1. Energy was found out by using Bomb calorimeter (Plate I)
2. Protein by Microkjeldahl method
3. Fat using soxhet's apparatus
4. Vitamin C by dye method (Plate II)
5. Fibre by extraction method
6. Iron by Calorimetric method, and
7. Calcium by titration method

The analytical procedures were followed from the National Institute of Nutrition Laboratory Manual and this was used for the above estimations (Appendix III).

6. Comparison of calculated and analysed value

Selected breakfast items were prepared, evaluated and then analysed. Nutritive value of the food stuffs were calculated. The calculated value of each item was compared with that of analysed value. This is done to

Plate - I

ESTIMATION OF ENERGY BY BOMB CALORIMETER



Plate - II

ESTIMATION OF VITAMIN C BY DYE METHOD



check the difference in the nutrient contribution between the raw foods and the cooked items. With the help of the above two methods a ready reckoner for each recipe were evolved to help the public to create an idea about the amount of food consumption and the nutrients present in the selected breakfast dishes.

Results and Discussion

IV RESULTS AND DISCUSSION

The results and discussion pertaining to this study is presented under the following headings.

- A. Assessing the Common Breakfast Items Prepared
- B. Preparation and Standardisation of the Breakfast Items
- C. Calculation of the Nutrients Using Raw Ingredients
- D. Quantitative Analysis of Selected Nutrients for the Breakfast Items
- E. Comparison of the Calculated Value with the Analysed Value and
- F. Formulation of the Ready Reckoner for the Selected Breakfast Preparations.

A. Assessing the Common Breakfast Items Prepared

1. Income pattern of the selected families

The following Table I gives the income pattern of the selected families.

TABLE I
INCOME PATTERN OF THE SELECTED FAMILIES

Total income	No. of families	Percent
Rs.1,000-2,000	6	12
Rs.2,001-3,000	27	54
Rs.3,001- above	17	34
Total	50	100

Among the 50 families surveyed 54 per cent of the families were found to be in the income range of Rs.2,000-3,000, 34 per cent of the families are getting Rs.3,000 and above as their income and rest 12 per cent were in the income range of Rs.1,000-2,000.

2. Food consumption pattern

Among the selected houses 86 per cent of the families were non-vegetarian, 10 per cent were vegetarian and rest of the 4 per cent were ova-vegetarians.

3. Food expenditure pattern

The following Table II gives the details about the food expenditure pattern of the selected families.

TABLE II
FOOD EXPENDITURE PATTERN

Amount spent on food per month (in Rs.)	N	Percent
Upto 1,000	29	58
Upto 2,000	10	38
Upto 3,000	2	4
Total	50	100

N = Number

From the survey conducted regarding their food expenditure, about 58 per cent of the families spent Rs.1,000 and below 38 per cent spent upto Rs.2,000 and remaining 4 per cent spent upto Rs.3,000.

4. Meal planning pattern

With regard to meal planning among the selected families 52 per cent of the families planned their meal previous day and get ready the ingredients required and the rest 48 per cent do not take interest to plan their meals.

5. Preference of food items

Among the 50 families 98 per cent gave preferences for the family members in the preparation of food and rest 2 per cent are not interested in asking about the likes and dislikes of their family members due to varied reasons.

6. Common breakfast items prepared by the families

From the survey conducted, 49 families preferred idli as their breakfast, 36 per cent preferred dosai, for 88 per cent poori was highly acceptable, 100 per cent of the families liked chapathi and 72 per cent preferred pongal and wheat uppuma respectively.

All the members preferred chutney, red gram dhal sambar, potato masal, vegetable kuruma as their side dish along with the above said main dishes.

7. Breakfast items prepared often by the families

Among the survey conducted 22 families often prepared idli and coconut chutney because of their ease in preparation, 38 per cent of the families prepared dosai and coconut chutney frequently, 16 per cent of the families preferred chapathi along with vegetable kuruma, 20 per cent of the families prepared poori and potato masal, 20 per cent of the families prepared wheat uppuma and coconut chutney and 12 per cent of them prepare chapathi and potato masal as their breakfast items.

8. Selection of South Indian breakfast combinations

The selected South Indian breakfast combinations are listed below :

- | | |
|----------------------------------|--|
| 1. Idli, coconut chutney | 2. Idli, redgram dhal sambar |
| 3. Poori, potato masal | 4. Poori, vegetable kuruma |
| 5. Chapathi, potato masal | 6. Chapathi, vegetable kur ^u ma |
| 7. Pongal, coconut chutney | 8. Kitchidi, coconut chutney |
| 9. Wheat uppuma, coconut chutney | 10. Dosai, coconut chutney |
| 11. Dosai, redgram dhal sambar. | |

The above listed combinations among the breakfast preparations are carefully selected by using different criterias. All these combinations are very much liked by the families and these items are often prepared and consumed.

B. Preparation and Standardisation of the Breakfast Items

The correct procedure for the selected dishes were given in the Appendix IV.

1. Idli

Idli was prepared with three variations listed below :

1. Rice	150g
Blackgram dhal	50g
2. Rice	200g
Blackgram dhal	50
3. Rice	250g
Blackgram dhal	50g

After the preparation the product was evaluated using the score cards. The scores obtained are presented in Table III.

TABLE III
SCORE CARD FOR IDLI

Criteria	Variation		
	I	II	III
	Mean score		
Appearance	2.60	3.0	2.1
Colour	2.16	2.8	2.7
Texture	2.16	2.8	2.6
Taste	2.40	3.0	2.2
Donness	3.00	3.0	3.0
Total	12.32	14.6	12.6
Maximum score = 15			

It is clear from the above table that the appearance, colour, texture, taste and donness of idli was found to be good in the second variation. So it proves that the ratio between the rice and the blackgram dhal must be 1:4 to obtain good quality and highly acceptable idlis with maximum score of 14.6. For the prepared idlis along with the evaluation and acceptability tests physical measurements like diameter, cooking time, number of idlis were also counted for the purpose of the formation or ready reckoner table. The highly acceptable product was used for calculation and analysis.

2. Dosai

Dosai was prepared by using three variations given below

The ratio of rice with blackgram dhal as 1:3, 1:4 and 1:5.

The prepared dosai (Plate III) was evaluated by the panel members using the given score card. The average scores obtained are given in Table IV.

TABLE IV
SCORE CARD FOR DOSAI

Criteria	Variation		
	I	II	III
	Mean scores		
Appearance	2.2	3.0	2.3
Colour	2.6	3.0	2.4
Texture	2.4	2.8	2.2
Taste	2.1	3.0	2.8
Donness	2.4	3.0	3.0
Total	11.7	14.8	12.7

Maximum score = 15

By the evaluation it is clearly given in the score card saying that the second variation using 50g of blackgram dhal with 200g of rice was found to be highly acceptable (score 14.8). In this variation all the criterias used got maximum scores.

Total number of dosais prepared, diameter and also the cooking time were noted and presented in the results. Calculation and analysis was done by using the product prepared out of second variation method.

3. Chapathi

Chapathi was prepared by using the following variations.

1. Wheat flour 80 gms + maida flour 20 gms
2. Wheat flour 60 gms + maida flour 40 gms
3. Wehat flour 50 gms + maida flour 50 gms

The following Table V presents the score card having the mean scores obtained for the product.

TABLE V
SCORE CARD FOR CHAPATHI

Criteria	Variation		
	I	II	II
	Mean scores		
Appearance	2.7	3.0	2.7
Colour	2.1	3.0	2.4
Texture	2.4	3.0	2.0
Taste	2.8	2.8	2.1
Donnes	3.0	3.0	2.8
Total	13.0	14.8	12.0

Maximum score = 15

Among the three variations used for the preparation of chapathi, the second variation was selected as the highly acceptable product by the panel members because of the very good appearance, colour, taste, donness and texture. The same sample was used for calculation and analysis. For this the diameter and cooking time were also noted.

4. Poori

Three varieties of poori were prepared namely the first one using 80 gms of wheat flour and 20 gms of maida flour and the second one using wheat flour 60 gms and maida 40 gms. In the third one both the flours are used equally as 50 gms : 50 gms.

The scores obtained for different variations of poori are presented in the following Table VI.

TABLE VI
SCORE CARD FOR POORI

Criteria	Variations		
	I	II	III
Mean scores			
Appearance	3.0	2.5	2.2
Colour	2.7	2.2	2.4
Texture	2.8	2.1	2.1
Taste	3.0	2.4	2.4
Donness	3.0	3.0	3.0
Total	14.5	12.2	12.1

Maximum score = 15



Plate - III

DOSAI WITH COCONUT CHUTNEY AND REDGRAM DHAL SAMBAR



Plate - IV

POORI WITH POTATO MASAL

From the three variations of poori preparation the first one was highly acceptable (scores 14.5). So to get best poories using 80g wheat flour and 20g of maida was found to be a suitable mixture. The highly acceptable product was selected for calculation and analysis (Plate IV).

5. Kitchidi

Kitchidi is one of the attractive breakfast item because of its appearance and also it gains more vitamins and minerals because of the vegetables present in it. Three combinations were done with vermicelli and wheat semolina in the ratio of 1:1, 3:2 and 2:3.

The average scores obtained for these preparations are presented in the following Table VII.

TABLE VII
SCORES CARD FOR KITCHIDI

Criteria	Variation		
	I	II	III
	Mean scores		
Appearance	2.8	3.0	2.2
Colour	2.2	3.0	2.8
Texture	2.4	3.0	2.8
Taste	2.5	3.0	2.5
Donness	2.8	3.0	3.0
Total	12.7	15.0	13.3

Maximum score = 15

Among the variations done by changing the ratio of vermicelli and semolina the second one was evaluated as the best preparation because it got the full score of 15. It is one of the best cereal vegetable combination to supply all the important nutrients in a single preparation.

6. Wheat uppuma

In the preparation of wheat uppuma only one cereal was used and the other ingredients added are the seasonal ingredients. So for three variations amount of oil used are added in the ratio of 20g, 40g and 60g for 100g of wheat rava.

The mean scores obtained for the three variations are presented in the following Table VIII.

TABLE VIII
SCORE CARD FOR WHEAT UPPUMA

Criteria	Variation		
	I	II	III
	Mean scores		
Appearance	2.2	2.8	3.0
Colour	2.3	2.8	2.4
Texture	2.8	2.4	3.0
Taste	2.4	2.4	3.0
Donness	3.0	3.0	3.0
Total	12.7	13.4	14.4

Among the three variations the third variation was found to be the best one and highly acceptable product. From this it was concluded that wheat uppuma with 15 grams of oil was best because with less quantity of oil it was dry and unacceptable.

7. Pongal

Pongal was prepared with raw rice and green gram dhal as main ingredients. Three variations used for the standardisation of pongal was given below.

- | | | |
|----|-----------------|------|
| 1. | Raw rice | 100g |
| | Green gram dhal | 40g |
| 2. | Raw rice | 100g |
| | Green gram dhal | 60g |
| 3. | Raw rice | 100g |
| | Green gram dhal | |

Table IX presents the mean scores obtained for pongal.

TABLE IX
SCORE CARD FOR PONGAL

Criteria	Variation		
	I	II	III
	Mean scores		
Appearance	2.8	2.8	2.8
Colour	2.9	3.0	2.2
Texture	2.4	3.0	2.2
Taste	3.0	3.0	2.2
Donness	3.2	2.8	2.2
Total	14.3	14.2	12.0

Maximum score = 15

From the above table it was concluded that the first variation namely using 100g of raw rice with 40g of green gram dhal was found to be the best one in appearance, colour, texture, taste and donness. In the other two preparation since the amount of green green gram dhal was more the texture of the product was unacceptable.

8. Coconut chutney

Coconut chutney was prepared by varying the amount of roasted bengal gram dhal. The amount of coconut used was kept constant along with that of the other ingredients. Since dhal is a thickening agent it can alter the texture, consistency and taste of the product. The amount of coconut used was 50g and for the three variations the amount of roasted bengal gram dhal used was 25g, 30g and 35g respectively.

The following Table X give the scores obtained for coconut chutney.

TABLE X
SCORE CARD FOR COCONUT CHUTNEY

Criteria	Variation		
	I	II	III
	Mean scores		
Appearance	3.0	3.0	3.0
Colour	3.0	2.8	2.1
Taste	2.8	2.4	2.8
Consistency	3.0	3.0	3.0
Donness	3.0	3.0	3.0
Total	14.8	14.2	13.9
Maximum score = 15			

Among the three preparations the first variation with the score of 14.8 was selected as the accepted product. To get a tasty and good quality chutney the combination of coconut and roasted bengal gram dhal plays an important role. Usually people think that more amount of coconut or only coconut will produce a best product. So in this table it is proved that for the preparation of chutney, the ratio of coconut and roasted bengal gram dhal must be 2:1.

9. Redgram dhal sambar

Always dhal preparations add to the increase in protein content of the diet especially in vegetarians. According to the taste preference of the people, vegetables can be added for this preparation. Since each vegetable has its own nutrient content, in the present study the investigator prepared sambar using onion. In this preparation following three variations are used by changing the amount of tamarind pulp.

1. Using 3g of tamarind pulp
2. Using 5g of tamarind pulp
3. Using 8g of tamarind pulp

The following Table XI gives the scores obtained for sambar.

TABLE XI
SCORE CARD FOR REDGRAM DHAL SAMBAR

Criteria	Variation		
	I	II	III
	Mean scores		
Appearance	3.0	2.5	2.8
Colour	3.0	3.0	3.0
Taste	2.8	2.4	2.5
Consistency	3.0	3.0	3.0
Donness	3.0	3.0	3.0
Total	14.8	13.9	14.3

Maximum score = 15

In the case of sambar preparation, among the three variations the first one was selected as standard preparation for its highest score (14.8). Since redgram dhal was the only main ingredient the variations were done by changing the tamarind pulp. The sambar is considered as the best side dish among the South Indian preparations along with any main item of breakfast.

10. Vegetable kuruma

Vegetable kuruma was eye appealing because of the colour of the product. Three varieties of kuruma were prepared by varying the proportion of coconut. The coconut added was 15g, 20g and 25g respectively for the 3

variations. The product with 15g of coconut was found to be more accepted by the panel members. Kuruma contains all vitamins and minerals because the vegetables were added for the preparations.

The scores obtained for the three variations are presented in the following Table XII.

TABLE XII
SCORE CARD FOR VEGETABLE KURUMA

Criteria	Variation		
	I	II	III
	Mean scores		
Appearance	3.0	2.8	2.1
Colour	2.7	2.1	2.8
Texture	2.8	2.4	2.7
Taste	3.0	2.1	2.1
Donness	3.0	3.0	3.0
Total	14.5	12.4	12.7

Maximum score = 15

Among the three variations the first one was found to be the best product, because little amount of coconut may enhance the taste of a product than using in excess.

11. Potato masal

Potato masal was prepared for a side dish along with chapathi and poori. Since potato is rich in complex carbohydrates definitely this will increase the energy content of the preparation especially if it is combined with poori. According to Gopalan et al., (1983). Among the root vegetables commonly consumed in our country the percentage of people consuming potato is maximum when compared to tapioca, sweet potato, carrots and yan.

The scores obtained for this preparation shows that maximum score was obtained for the first combination (14.3) whereas the second and third one got only 10.5 and 10.9 respectively.

C. Calculation of the Nutrients Using Raw Ingredients

For all the breakfast items selected, the raw ingredients were carefully weighed and with the help of the nutritive value book the nutrients were calculated for each preparation.

The following Tables XII, XIIA and XIIB presents the nutrient content of the breakfast combinations.

A wholesome breakfast can have surprising benefits. One study even suggests that those who regularly eat breakfast have significantly lower cholesterol levels than breakfast skippers. And among breakfast eaters, the cholesterol level of those who eat a high-fibre cereal, is

significantly lower than those who do not (Nutrition Education Service, 1992).

The first combination namely idli and coconut chutney provides 33g of protein per 2 serving and fat content is 23.7g. In the case of energy it is meeting 1/3 of RDA for an adult man that is 580 K.cal whereas fibre content is 3.56g per 2 servings. With regard to mineral content it provides 129 mg of calcium and 7.4 mg of iron for 2 servings along with 8.0 mg of vitamin C. When idli is combined with redgram dhal sambar it provides 30.86g of protein, 6.9g of fat, 1.6 of fibre along with 1023 K.cal of energy for 2 servings. In the case of calcium it was calculated as 144.5 mg and also it contains 5.2 mg of iron and 10 mg of ascorbic acid.

TABLE XIII
NUTRIENT CONTENT OF IDLI AND DOSAI, COCONUT CHUTNEY
AND SAMBAR

Combination	No. of Serv- ing	Protein g	Fat g	Fibre g	Energy K.cal	Calcium mg	Iron mg	Vitamin C mg
Idli		24.80	15.00	0.8	866	95	3.9	0.00
Coconut chutney		8.26	22.22	2.76	323	34	3.5	8.03
Total	2	33.06	23.7	3.56	1189	129	7.4	8.03
Idli		24.8	1.5	0.8	866	95	3.9	0.00
Redgram dhal sambar		6.06	5.4	0.8	157	49	1.3	10.00
Total	2	30.86	6.9	1.6	1023	144	5.2	10.00
Dosai		24.8	14.5	0.8	982	95	3.9	0.00
Coconut chutney		8.26	22.2	2.8	323	34	3.5	8.03
Total	2	33.06	36.7	3.6	1305	133	7.4	8.03
Dosai		24.8	14.5	0.8	982	95	3.9	0.00
Redgram dhal sambar		6.06	5.4	0.8	157	49	1.3	10.00
Total	2	30.86	19.9	1.6	1139	144	5.2	10.06

TABLE XIII A
 NUTRIENT CONTENT OF CHAPATHI AND POORI WITH POTATO MASAL AND
 VEGETABLE KURUMA

Combinations	No. of Serv- ing	Protein g	Fat g	Fibre g	Energy K.cal	Calcium mg	Iron mg	Vitamin C mg
Chapathi		11.6	6.3	1.2	389	38.00	3.9	0
Vegetable kuruma		2.6	11.5	2.3	177	79.3	3.5	17.64
Total	2	14.2	17.8	3.5	566	117.3	7.4	17.64
Chpathi		11.6	6.3	1.2	389	38.0	3.9	0
Potato masal		2.1	5.6	1.0	133	47.7	1.6	20.04
Total	2	13.7	11.9	2.2	522	85.7	5.5	20.04
Poori		11.8	21.46	1.5	522	43.00	4.42	0
Vegetable kuruma		2.6	11.5	2.3	177	79.13	3.5	17.64
Total	2	14.4	32.96	3.8	699	122.18	7.9	17.64
Poori		11.8	21.46	1.5	522	43.00	4.42	0
Potato masal		2.1	5.6	1.0	133	47.7	1.6	20.04
Total	2	13.9	27.06	2.5	655	90.7	6.02	20.04

TABLE XIII B
NUTRIENT CONTENT OF PONGAL WHEAT UPPUMA AND KITCHIDI WITH
COCONUT CHUTNEY

Combinations	No. of serving	Protein g	Fat g	Fibre g	Energy K.cal	Calcium mg	Iron mg	Vitamin C mg
Pongal		21.64	70.56	1.2	1168	86.8	3.6	0
Coconut chutney		8.26	22.2	2.7	323	34.4	3.5	8.03
Total	2	29.9	92.76	3.96	1491	121.4	7.1	13.53
Wheat uppuma		13.4	62.72	3.6	957	118.0	3.88	56.4
Coconut chutney		8.26	22.2	2.76	323	34.4	3.5	8.03
Total	2	21.6	84.92	6.36	1280	152.00	7.38	69.93
Kitchidi		12.84	20.98	2.82	598	154.8	3.4	24.8
Coconut chutney		8.26	22.2	2.76	323	34.4	3.5	8.03
Total	2	21.1	43.18	5.58	921	189.00	6.9	32.83

The other combination prepared was dosai with coconut chutney, and the nutrients provided by this combination are protein 33.06g, fat 36.7g, and fibre 3.6g. Along with this it provides 1305 K.cal of energy, 133 mg of calcium and 7.4 mg of iron and 8.03 mg of vitamin C. All these nutrients are for 2 serving of the items prepared.

Dosai with redgram dhal sambar was also selected as one of the highly acceptable combinations. It provides 30.86g of protein 19.9g of fat, 1.6g of fibre, and also 1139 K.cal of energy, 144 mg of calcium, 5.2 mg of iron and 10 mg of ascorbic acid.

The above table clearly states that the breakfast items listed are definitely meeting the body needs of the people upto their satisfaction.

From the wheat preparations, poori and chapathi were made with vegetable kuruma and potatomasal as their side dishes.

The first combinations namely chapathi and vegetable kuruma provides 14.2g of protein per 2 serving and fat content 17.8g, fibre 3.5g, 566 K.cal of energy, calcium was about 117 mg and iron about 7.4 mg and 17.64 mg of vitamin C.

When chapathi was combined with potao-masal it provides 13.7g of protein, 11.9g of fat, 2.2g of fibre along with 522 K.cal of energy for 2 servings. In the case of calcium it was calculated as 85 mg, 5.5 mg of iron and 20.04 mg of ascorbic acid.

The other combinations selected was poori and vegetable kuruma, and the nutrients provided are protein 14.4g, fat 32.96g and fibre 3.8g. Along with 399 K.cal of energy 122 mg of calcium, 7.92mg of iron and 17.64 mg of

vitamin C are provided. All these nutrients are for two servings of the items prepared.

Poori with potato masal was also selected as the highly acceptable combination. It provides 13.9g of protein, 27.06g of fat, 2.5g of fibre, 655 K.cal of energy, 90 mg of calcium and 6.02 mg of iron and 20.04 mg of vitamin C. These two combinations are prepared often.

In the first combination pongal with coconut chutney, the protein content was found to be 29.9g, 92.76g fat, 3.96g of fibre, 1491 K.cal of energy, 121 mg of calcium, 7.1 mg of iron and 8.03 mg of vitamin C. The calculation of nutrients was done for 2 servings of pongal and coconut chutney.

The second combination prepared for 2 people was wheat uppuma and coconut chutney, which provide protein 21.46g, 84.92g of fat, 6.36g of fibre, 1230 K.cal of energy, 152 mg of calcium, 7.38 mg of iron and 69.93 mg of vitamin C.

In the kitchidi and coconut chutney combination, the protein content was found to be 21.1g of protein, 43.18g of fat, 5.5g fibre, 921 K.cal of energy, 189 mg of calcium, 6.9 mg of iron and 32.83 mg of Vitamin C. All the above nutrients are present in two serving of the items prepared. Individual calculations are given in the Appendix V.

D. Quantitative Analysis of Selected Nutrients for the Breakfast Items

In research situations, when it is essential to know the exact intake of a nutrient, the food is weighed accurately and a representative or aliquotes sample is saved for chemical analysis in the laboratory. The determination of nutritive value of a diet in this way is accurate but it is too expensive for routine dietary studies.

In this present study for all the breakfast items selected, preparation and standardisation was done by the investigator. For the standard preparations the sub sample were collected for quantitative analysis of selected nutrients like energy, protein, fat, fibre, calcium, iron and vitamin C.

Estimation of ascorbic acid was done by using dye method on the same day of preparation. For the analysis of nutrients like energy, protein, fat, calcium and iron, the cooked sample was converted into dry form and used. All their estimations were conducted in the laboratory by using standard procedures.

The analysed value of the breakfast combinations serving each for idli, dosai along with side dishes is presented in the following Table XIV, XIV A, XIV B.

TABLE XIV
NUTRIENT CONTENT OF THE PREPARATIONS - IDLI, DOSAI WITH
COCONUT CHUTNEY AND REDGRAM DHAL SAMBAR
(ANALYSED VALUE)

Combinations	No. of serving	Protein g	Fat g	Fibre g	Energy K.cal	Calcium mg	Iron mg	Vitamin C mg
Idli		22.0	1.0	0.6	833	91	3.5	0
Coconut chutney		8.0	20.8	2.2	312	32	3.0	5.6
Total	2	30.4	21.8	2.8	1145	123	6.5	5.6
Dosai		22.1	13.9	0.8	846	88	3.2	0
Coconut chutney		8.0	20.8	2.2	312	32	3.0	5.6
Total	2	30.1	34.7	3.0	1158	120	6.2	5.6
Dosai		22.1	13.9	0.8	846	88	3.0	5.6
Redgram dhal		27.5	18.9	1.5	988	131	3.9	9.3

In the first combination the analysed value of idli was found to be having 22.4g of protein, 1g fat, 0.6g fibre, 833 K.cal of energy, 91 mg of calcium and 3.5 mg of iron.

In the case of coconut chutney it provides 8g of protein, 20.8g of fat, because of its coconut content and 2.2g of fibre, 312 K.cal of energy with 32 mg of calcium, 3 mg of iron and 5.6 mg of ascorbic acid. Since coconut chutney does not require any cooking, there is no cooking loss of nutrients, especially the ascorbic acid.

With regard to the nutrient content of dosai it contains 22.1g of protein, 13.9g of fat, 0.5g of fibre, 846 K.cal of energy, 88 mg of calcium, 3.2 mg of iron and no ascorbic acid. The fat content of dosai was more due to the oil used during cooking.

Redgram dhal sambar was prepared as the best combination for idli and dosai. The nutrients present in the redgram dhal sambar was found to be 5.4g of protein, 5g of fat, 0.7g of fibre, 142 K.cal of energy, 43 mg of calcium, 0.9 mg of iron, 3.7 mg of ascorbic acid for the total amount prepared for 2 persons.

TABLE XIV A
NUTRIENT CONTENT OF THE PREPARATIONS -CHAPATHI, POORI WITH VEGETABLE
KURMA AND POTATO MASAL (ANALYSED VALUE)

Combinations	No. of serv- ing	Protein g	Fat g	Fibre g	Energy K.cal	Calcium mg	Iron mg	Vitamin C mg
Chapathi		10.0	5.4	0.7	371	33	3.2	0
Vegetable Kuruma		2.1	10.0	2.0	169	79	1.2	2.8
Total	2	12.1	15.4	2.7	540	112	4.4	2.8
Chapathi		10.0	5.4	0.7	371	33	3.2	0
Potato masal		1.6	4.9	0.6	115	33	1.6	2.3
Total	2	11.6	10.3	1.3	486	66	4.8	2.3
Poori		10.0	18.4	1.4	451	40	4.3	0
Vegetable kuruma		2.1	10.0	2.0	169	79	1.2	2.8
Total	2	12.1	28.4	3.4	440	119	5.5	2.8
Poori		10.0	18.4	1.4	271	40	4.3	0
Potato masal		1.6	4.9	0.6	115	33	1.6	2.3
Total	2	11.6	23.2	2.0	386	73	5.9	2.3

TABLE XIV B
NUTRIENT CONTENT OF THE PREPARATIONS - PONGAL, WHEAT UPPUMA
KITCHIDI WITH COCONUT CHUTNEY
(ANALYSED VALUE)

Combinations	No. of servings	Protein g	Fat g	Fibre g	Energy K.cal	Calcium mg	Iron mg	Vitamin C mg
Pongal		20.2	64.4	1.3	1132	81.2	2.6	0
Coconut chutney		8.0	2.8	2.8	312	32.0	3.0	5.6
Total	2	28.2	67.2	3.5	1444	113.2	5.6	5.6
Wheat uppuma		12.4	57.2	3.4	948	134.0	2.8	4.2
Coconut chutney		8.0	2.8	2.2	312	32.0	3.0	5.6
Total	2	20.4	60.0	5.6	1260	166.0	5.8	12.8
Kitchidi		10.1	16.2	1.8	566	140.0	2.8	1.4
Coconut chutney		8.0	2.8	2.2	312	32.0	3.0	5.6
Total	2	18.14	19.0	4.0	878	172.0	5.8	7.0

In the preparation of chapathi the nutrient content of the total prepared amount (2 servings) were analysed and given as follows : 10g of protein, 5.5g of fat, 0.7g of fibre, 371 K.cal of energy, 33 mg of calcium and 3.2 mg of iron.

Another attractive item prepared was poori, for which wheat flour and maida flour was used. Poori prepared

for 2 serving provides 10g of protein, 18.4g of fat because of **deep** fat frying, 1.4g of fibre because of the wheat flour, 451 K.cal of energy, 40 mg of calcium, 4.3 mg of iron with 0 mg of ascorbic acid.

The analysed value for the two servings of vegetable kur^uma consists of 2.1g of protein, 1g of fat, 2g of fibre because of vegetables added, 169 K.cal of energy, 79 mg of calcium, 1.2g of iron, with 2.8 mg of ascorbic acid.

Another root vegetable dish that is suitable for the wheat preparation is potato masal. The nutrient content of this was analysed and found to be having 1.6g of protein, 4.9g of fat, 0.6g of fibre, 115 K.cal of energy, 33 mg of calcium, 1.6 mg of iron and 2.3 mg of vitamin C.

Three cereal breakfast items namely pongal, wheat uppuma and kitchidi can be easily prepared by using simple method of preparation namely boiling.

In the case of pongal prepared for 2 persons it was analysed and the results show that it provides 20.2g of protein, 64.4g of fat because of its oil and ghee and 1.3g of fibre, 1132 K.cal of energy, 81.2 mg of calcium and 2.6 mg of iron.

Wheat uppuma prepared contains 12.4g of protein, 57.2g of fat that is because of the oil added to increase the acceptability and 3.4g of fibre because of the wheat

ravai and 946 K.cal of energy, 134 mg of calcium, 12.8 mg of iron and 4.62 mg of ascorbic acid.

The analysed value for the to serving kitchidi contains 10.1g of protein, 16.2g of fat, 1.8g of fibre, 566 K.cal of energy, 149 mg of calcium, 2.8 mg of iron and 1.4 mg of vitamin C.

E. Comparison of the Calculated Value of the Analysed Value for the Items Prepared

The usual procedure to find out the nutrient intake of the individual is by calculating the nutrients present in the raw ingredients and summarising it. But to get the accurate value and to rectify the loss in cooking, the nutrients present in the items consumed were analysed quantitatively by using the cooked samples.

The comparison between the calculated value using raw ingredients and analysed value using cooked product is presented in following Table XV and XVA.

In the preparation of idli among the two methods it is clearly stated that almost all the nutrients are showing lesser value, for the analysed method when compared to the calculated method. With regard to protein the loss shown in the above table was 9.5 per cent and maximum loss was shown in the case of fat namely 32 per cent this may be because of the loss during preparation and cooking of the idlis. In the case of fibre the loss is 25 per cent it may be

TABLE XV
COMPARISON OF THE CALCULATED VALUE WITH THE ANALYSED VALUE

Items	Sample	Protein g	Fat g	Fibre g	Energy K.cal	Calcium mg	Iron mg	Vitamin C mg
Idli	C	24.8	1.5	0.8	866	95	3.9	0
	A	22.4	1.02	0.6	833	91	3.5	-
Percentage of difference		- 9.7	- 32	- 25	- 4	- 4	- 10	-
Dosai	C	24.8	14.8	0.8	982	95	3.9	0
	A	22.1	13.9	0.8	846	88	3.2	-
Percentage of difference		- 11	- 4	- 0	-14	- 7	- 18	-
Coconut chutney	C	8.2	22.2	2.8	323	34	3.5	8.03
	A	8.0	20.9	2.2	312	32	3.0	5.6
Percentage of difference		- 2	- 6	- 21	- 3	- 6	- 14	-30
Redgram dhal sambar	C	6.0	5.4	0.8	157	49	1.3	1.0
	A	5.4	5.0	0.7	142	43	0.9	3.7
Percentage of difference		- 10	- 7	-12.5	-10	-12	- 31	-63
Chapathi	C	11.6	6.3	1.2	389	38	3.9	0
	A	10.0	5.4	0.7	371	35	3.2	0
Percentage of difference		- 14	- 14	-42	- 5	- 8	- 18	-

C - Calculated value

A - Analysed value

TABLE XVA
COMPARISON OF THE CALCULATED VALUE WITH ANALYSED VALUE

Items	Sample	Protein g	Fat g	Fibre g	Energy K.cal	Calcium mg	Iron mg	Vitamin C mg
Poori	C	11.8	21.4	1.5	522	43	4.4	0
	A	10.0	18.4	1.4	451	40	4.3	0
Percentage of difference		-15	-14	17	-14	-7	-2	-0
Vegetable kuruma	C	2.6	11.5	2.3	177	79.1	3.5	17.6
	A	2.1	10.0	2.0	169	79	1.2	2.8
Percentage of difference		-19	-13	-13	-5	-0	-68	-84
Potato masal	C	2.1	5.6	1.0	133	47	1.6	20
	A	1.6	4.9	0.6	115	33	1.6	2.3
Percentage of difference		-25	-12.5	-40	-13.5	-30	-0	-88.5
Pongal	C	21.6	70.5	1.5	1168	86.8	3.8	0
	A	20.0	64.4	1.3	1132	81.2	2.6	0
Percentage of difference		-7	-8.6	-13	-3	-6.5	-31.5	-0
Wheat uppuma	C	13.4	62.72	3.6	956	118	3.8	56.4
	A	12.4	57.2	3.4	948	104	2.8	4.2
Percentage of difference		-7.5	-8.8	-6	-1	-12	-26	-92
Kitchidi	C	12.8	21.0	2.8	598	154	3.4	24.8
	A	10.0	16.2	1.8	566	140	2.8	1.4
Percentage of difference		-21	-23	-36	-5	-9	-18	-94

due to the preparation of dough. With regard to the energy and calcium there was not much loss between the calculated and analysed value (4 per cent). The iron loss is showed as just 10 per cent.

The percentage of difference between the calculated value and analysed value of dosai ranged from 2-18 per cent but minimum loss was shown in the case of energy as 14 per cent. There was 4 per cent loss with regard to the fat because the oil was added only during the preparation of dosai. The calcium loss was showed as 7 per cent, with regard to iron it was 18 per cent.

In the preparation of coconut chutney maximum loss (30 per cent) as shown for ascorbic acid because of the destruction of this vitamin during the extraction and sample preparation. Next to that the loss is 21 per cent in the case of fibre this may be due to grinding procedure. Then the fat and calcium loss was found to be 6 per cent each and protein only 2 per cent.

Another preparation namely redgram dhal sambar showed 63 per cent loss during cooking in the case of ascorbic acid. Where as it was slightly excess (31 per cent) for iron. When compared with the other recipes. With regard to energy and protein the analysed value was 10 per cent less when compared to the calculated value this may be due to the loss during cooking. There are 7 per cent, 12.5

per cent and 12 per cent loss were shown with regard to fat, fibre and calcium respectively for the sambar.

In chapathi preparation 42 per cent of the fibre was missing in the analysed value shown in the table. Eighteen per cent loss was present in the case of iron. This may be due to the presence of interfering compounds present in the item. The loss of protein and fat were shown as 14 per cent and only 5 per cent loss in the case of energy and 8 per cent in calcium.

The analysed value shown in the above table for poori was lesser in all nutrients except energy when compared to the calculated value. This loss may be due to the absorption of oil in the preparation so it was found to be 14 per cent less when compared to the analysed value for energy. Due to the deep fat frying of poori the loss of protein was calculated as 15 per cent and fat 14 per cent. In the case of fibre and calcium it was given as 7 per cent each but the iron loss was only minimum.

In the preparation of vegetable kuruma the percentage difference of analysed value and calculated value was ranging from 5 per cent to 84 per cent. This may be due to the cooking of vegetables. Maximum loss was with regard to iron and ascorbic acid, minimum loss was seen in energy.

In the case of potato masal it was clearly shown that the loss of fibre due to cooking is recorded as 40 per cent and 88.5 per cent of loss in the case of ascorbic acid, all the other nutrients the loss ranges from 12.5 per cent to 30 per cent.

In the case of pongal preparation due to cooking and analysis the loss for the selected nutrients calculated are as follows : Protein 7 per cent, fat 8.6 per cent, fibre 13 per cent, energy 3 per cent, calcium 6.5 per cent and iron 31.2 per cent.

With regard to wheat uppuma preparation minimum loss was shown in the case of energy and maximum loss was shown in ascorbic acid namely 92 per cent. This may be due to seasoning and frying of the other ingredients contains more amount of ascorbic acid. The loss of fibre was shown as 6 per cent and iron 26 per cent, loss of protein and fat was shown 8.8 per cent respectively.

In the preparation of kitchidi the maximum loss is 94 per cent. This was due to frying and boiling with regard to protein, 21 per cent loss due to cooking and fat loss was shown to be 23 per cent, loss of fibre due to boiling and mixing as 36 per cent and only 5 per cent and 9 per cent were shown in energy and calcium respectively.

So the above table concludes the following points

1. During cooking and analysing definitely the loss of nutrients occur.

COMPARISON OF CALCULATED VALUE WITH THE ANALYSED VALUE

PROTEIN

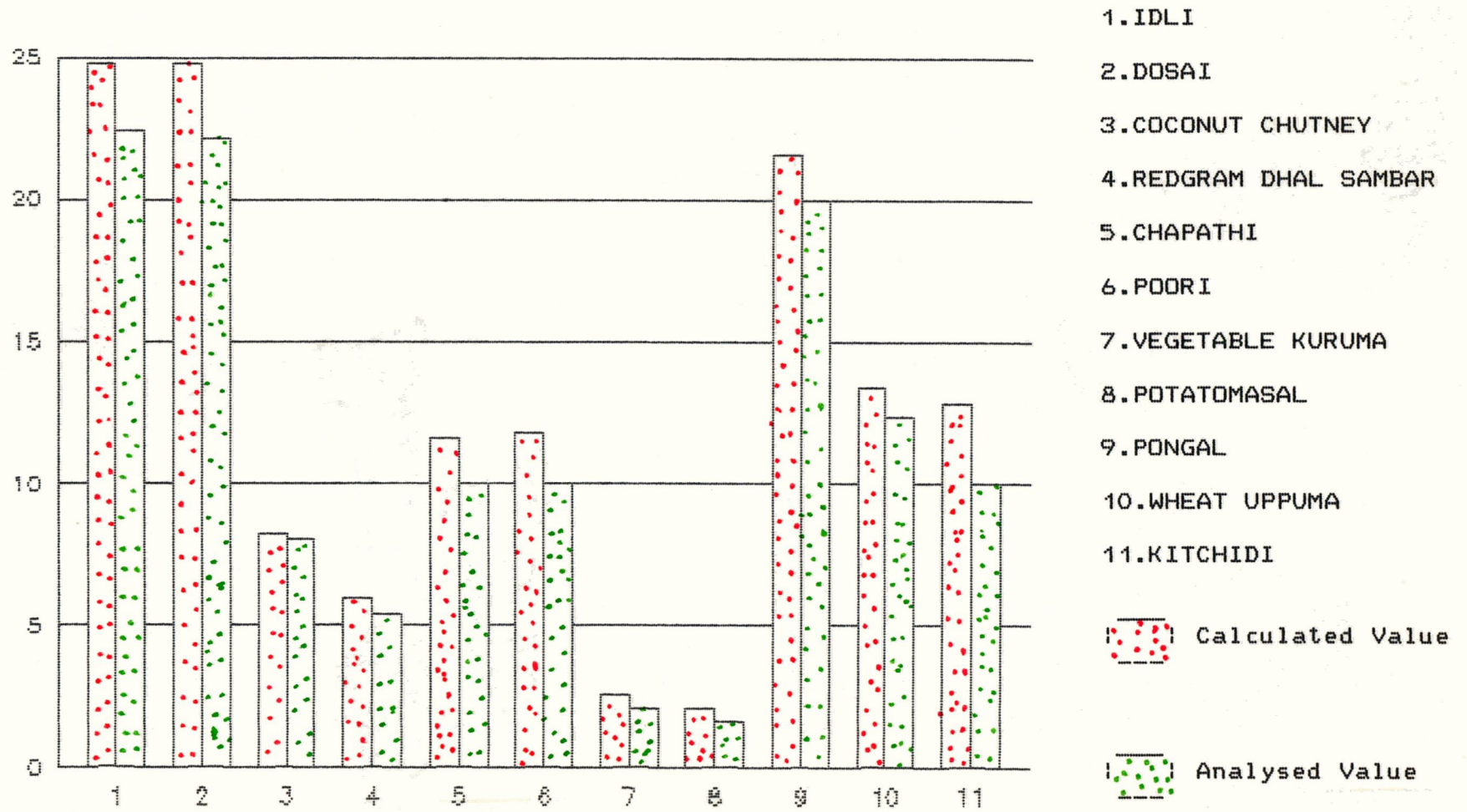


FIGURE - 1

COMPARISON OF CALCULATED VALUE WITH THE ANALYSED VALUE

FAT

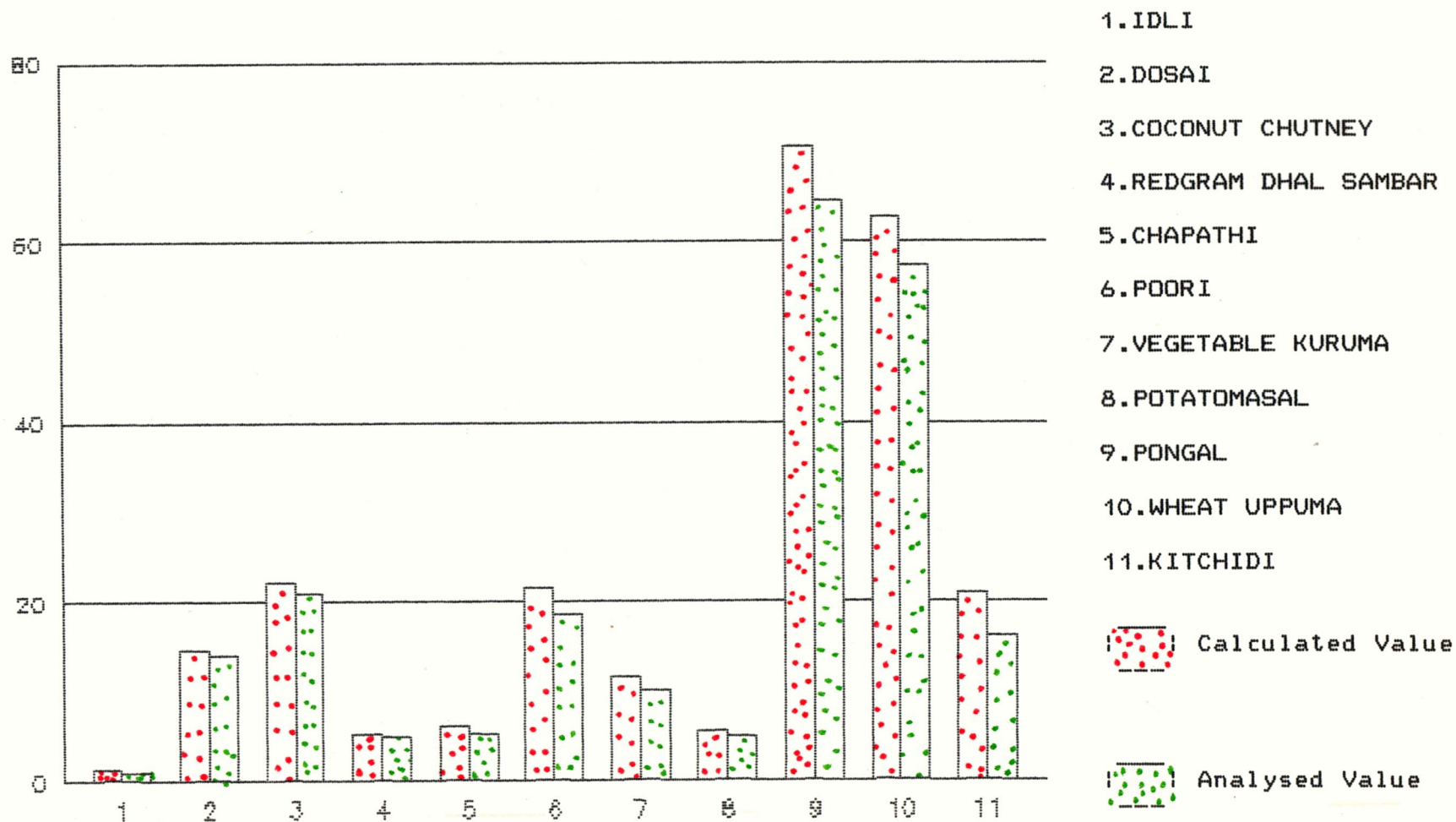


FIGURE - 2

COMPARISON OF CALCULATED VALUE WITH THE ANALYSED VALUE

FIBRE

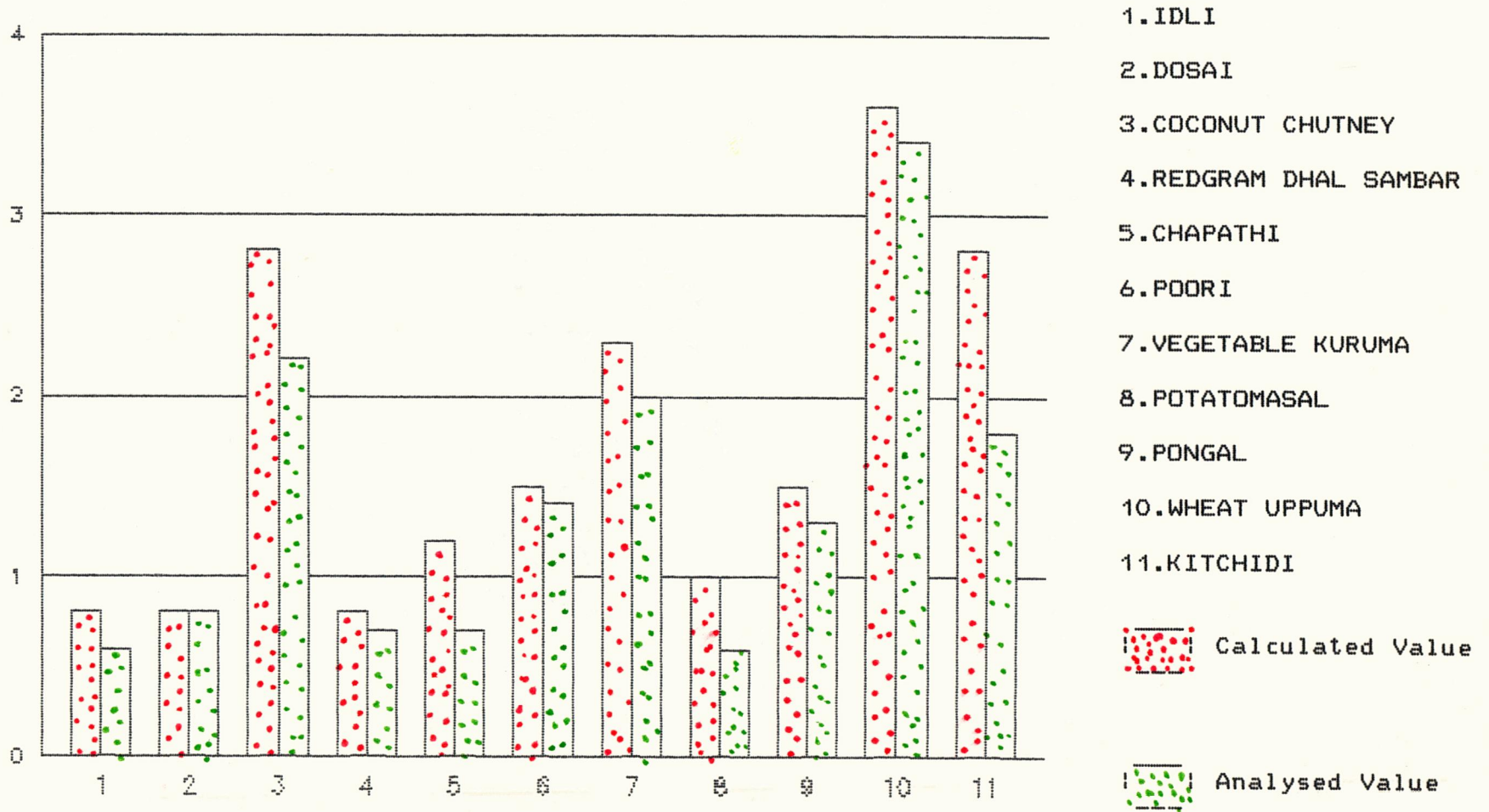


FIGURE - 3

COMPARISON OF CALCULATED VALUE WITH THE ANALYSED VALUE

ENERGY

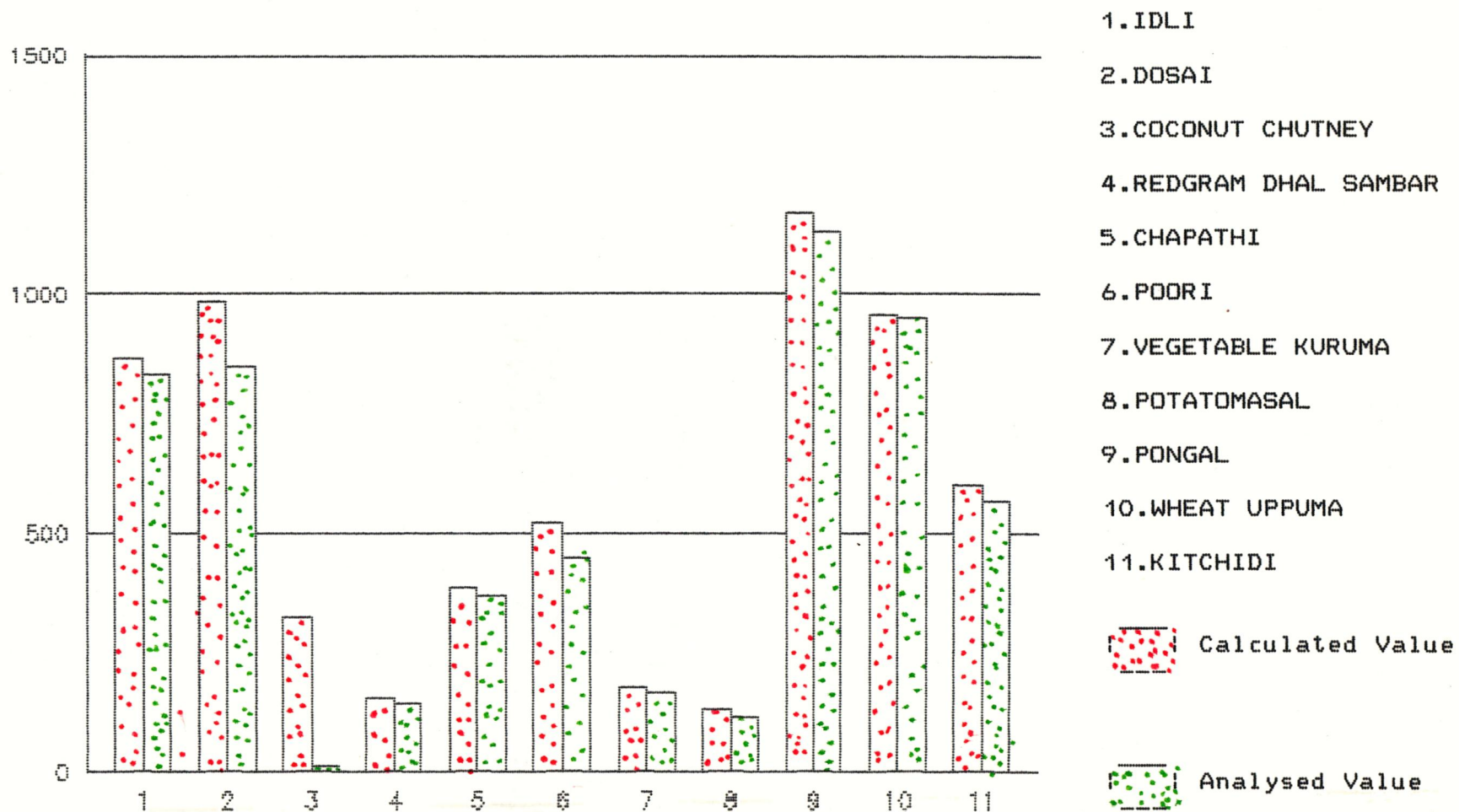


FIGURE - 4

COMPARISON OF CALCULATED VALUE WITH THE ANALYSED VALUE

CALCIUM

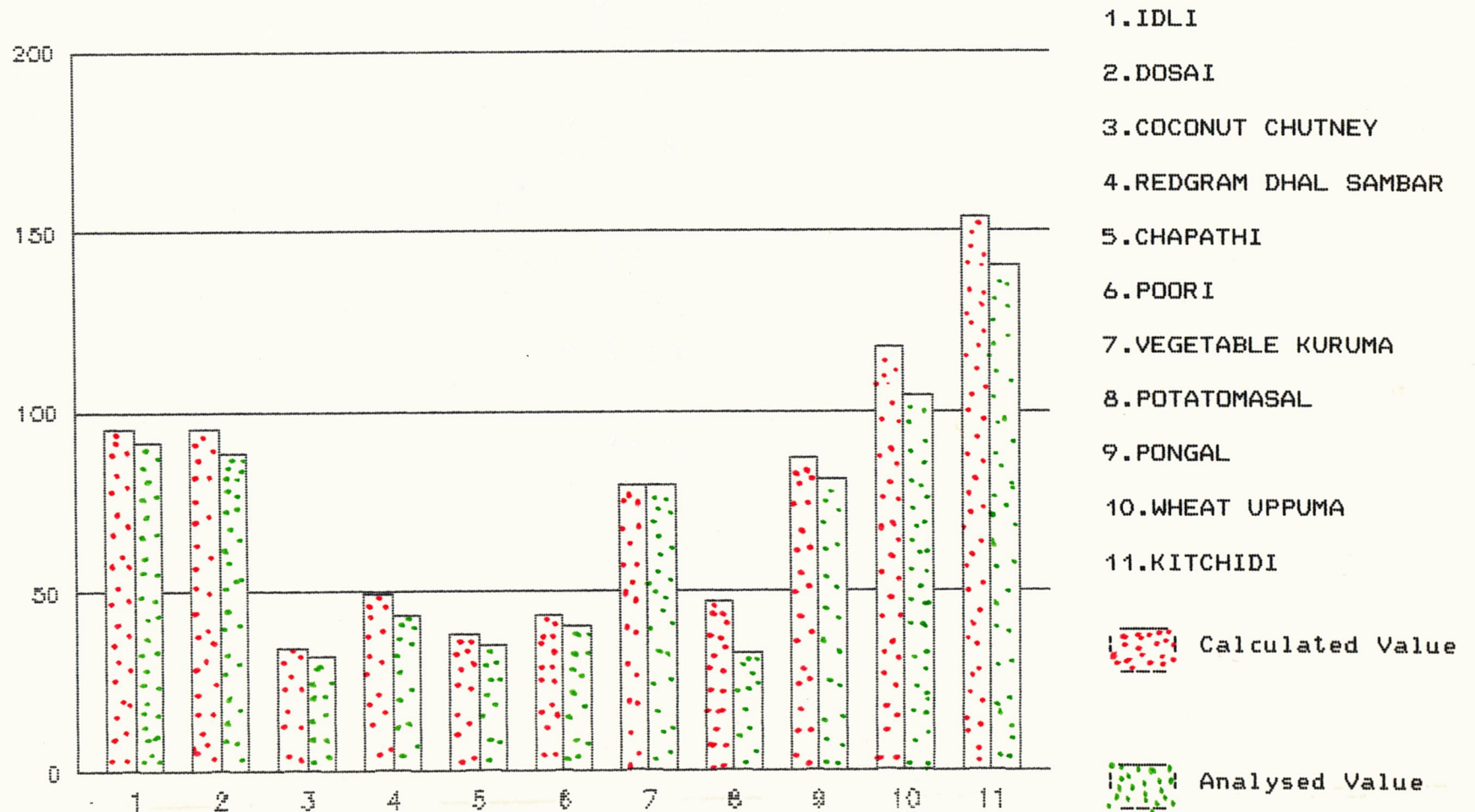


FIGURE - 5

COMPARISON OF CALCULATED VALUE WITH THE ANALYSED VALUE

IRON

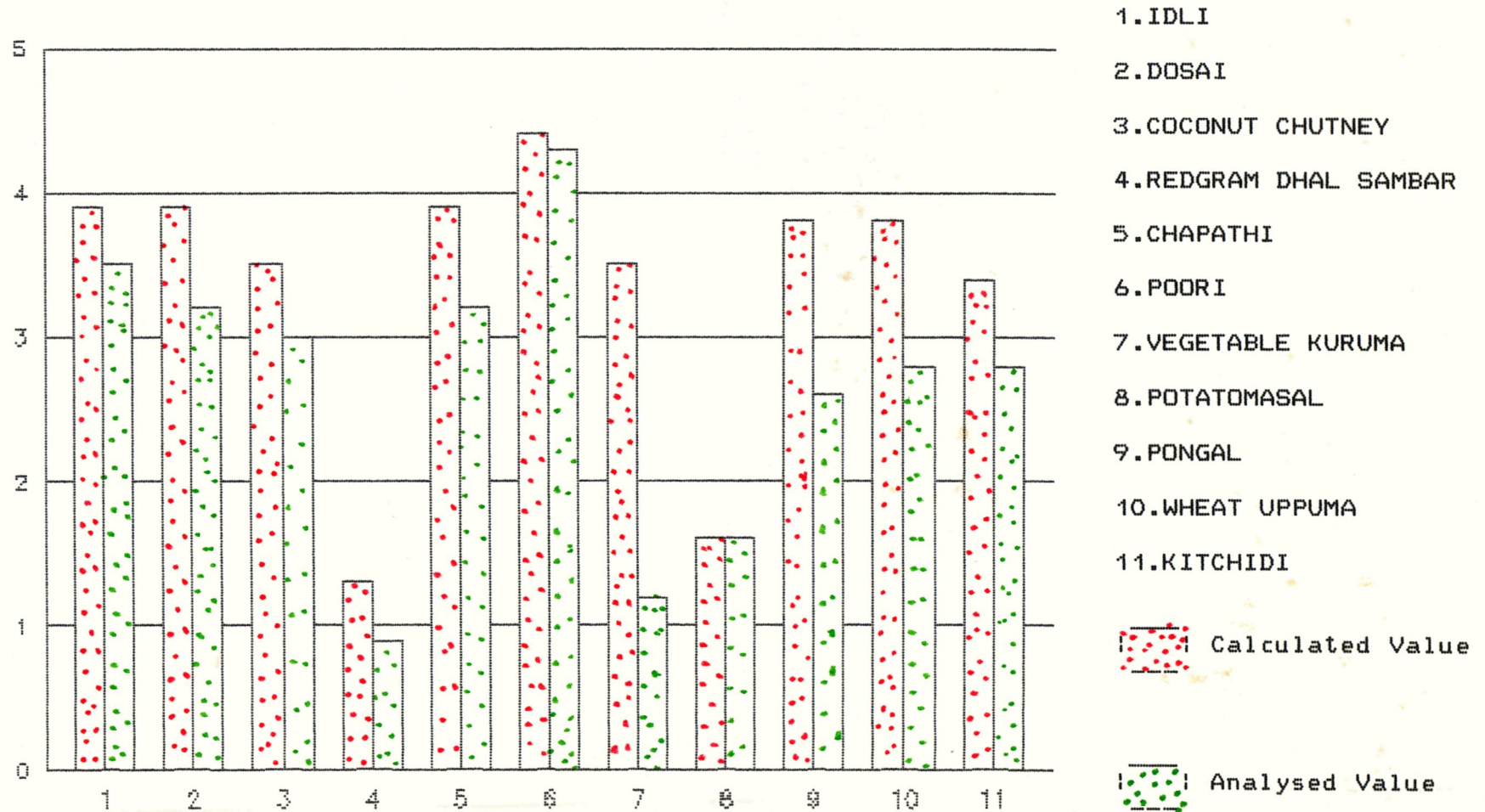


FIGURE - 6

COMPARISON OF CALCULATED VALUE WITH THE ANALYSED VALUE

VITAMIN C

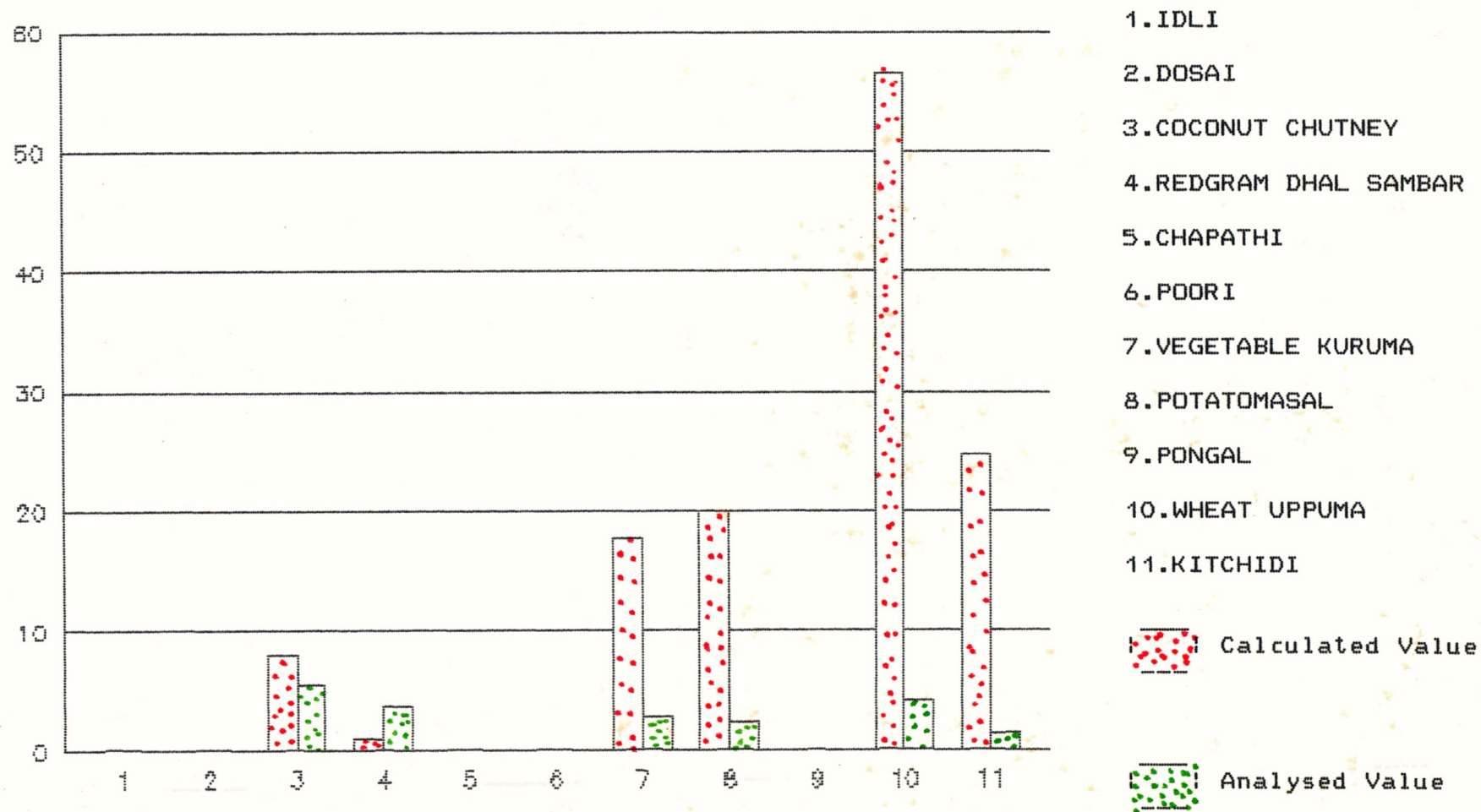


FIGURE - 7

2. The maximum loss was shown with regard to ascorbic acid but that was the known fact and also it was due to the specific characteristic and chemical nature of ascorbic acid.
3. In the case of energy only minimum loss occur during the processing and cooking. For the estimation of energy in Bomb just the dried product are directly used with out any interfering compounds. So there was no chance for maximum loss of energy.
4. Totally the percentage of loss of iron was more when compared to calcium but for both the nutrients same ash solution was used for analysis.
5. The fibre loss varied from item to item that may be due to pre-preparation on cooking or during analysis.
6. With regard to the fat and protein the cooked product were directly used for the analysis. So these loss may be due to the methods used for cooking only.

The comparison calculated value with analysed value obtained for various items were depicted in the figure I to VII.

F. Formulation of Ready Reckoner for the Selected Breakfast Preparations

Nutritionist and food scientist discuss much about the importance of nutrient intake, digestion, absorption and utilisation capacity of the individual.

All human being prepare items and consume it as a meal without understanding or knowing the availability of nutrients from each item they have consumed. So it is very important to formulate a ready reckoner for the public to be aware of the facts that, what kind, quality and the quantity of nutrients are present in each preparation. Data regarding this is not as such available for the people to use it. In this present study the ready reckoner for the selected South Indian Breakfast items were formulated and presented in the following Table XVI and XVI A.

Ready reckoner for selected breakfast items like idli, dosai, coconut chutney, red gramdhal sambar, chapathi, poori, vegetable kuruma, potato masal, pongal, wheatuppuma and kitchidi was given separately in the table for two servings. This helps the public to know how much amount of nutrients are present in it. This makes the people aware of the nutrients presents for two servings. For each combination the nutrient content is given. In the case of idli and coconut chutney it contains 30.4g of protein, 21.8g of fat, 2.8g of fibre, 1145 K.cal of energy, 123 mg of calcium, 6.5 mg of iron and 5.6 mg of vitamin C. When the same idli is combined with redgram dhal sambar, the protein content was found to be 30.2g, 6.5g of fat, 1.5 of fibre, 975 K.cal of energy, 134 mg of calcium, 4.4 mg of iron and 3.7 mg of vitamin C.

*
 READY RECONER FOR SELECTED BREAKFAST ITEMS IDLI DOSAI COCONUT CHUTNEY REDGRAM DHAL SAMBAR
 CHAPATHI, POORI, VEGETABLE KURUMA POTATO MASAL PONGAL WHEAT UPPUMA AND KITCHIDI

Items	No Volume	Dia- meter cm	Total cooked weight	Cooking time minutes	Nutrient content of analysed foods						
					Protein g	Fat g	Fibre g	Energy K.cal	Calcium mg	Iron mg	Vitamin C mg
Idli	17	5	510	15							
Coconut chutney	tsp. 12	-	180	7	30.4	21.8	2.8	1145	123	6.5	5.6
Idli	17	5	510								
Redgram dhal sambar	8 tsp -	-	120	12	30.2	6.5	1.5	975	134	4.4	3.7
Dosai	13	1	975	4							
Coconut chutney	12 tsp -	-	180	7	30.1	34.7	3.0	1158	120	6.2	5.6
Chapathi	8	1	160	8							
Vegetable kuruma	8 tsp 1	1	120	10	12.1	15.4	2.7	540	112	4.4	2.8
Chapathi	8	1	160	8							
Potato masal	5 tsp 1	1	75	15	11.6	10.3	1.3	486	66	4.8	2.3

TABLE XVIA

Items	No volume	Dia- meter	Total cooked weight	Cooking time minutes	Nutrient content of analysed foods						
					Protein g	Fat g	Fibre g	Energy K.cal	Calcium mg	Iron mg	Vitamin C mg
Poori	8	1 cm	200	9	12.1	28.4	3.4	620	119	5.5	2.8
Vegetable kuruma	8 tsp		120	10							
Poori	8	$\frac{1}{4}$ -inch	200	9	11.6	23.3	2.0	386	73	5.9	2.3
Potato masal	5 tsp		-	7							
Pongal	2 cup		580	12	28.2	67.2	3.5	1444	113	5.6	5.6
Coconut chutney	12 tsp			7							
Wheat uppuma	2 cup		620	15	20.4	60.0	5.6	1260	136	5.8	12.8
Coconut chutney	12 tsp			7							
Kitchidi	2 cup		550	18	18.14	19.0	4.0	878	172	5.8	7.0
Coconut chutney	12 tsp			7							

In the next combination of dosai and coconut chutney, the protein content was found to be 30.1g, 34.7g of fat, 3.0g of fibre, 1158 K.cal of energy, 120 mg of calcium, 6.2 mg of iron and 5.6 mg of vitamin C.

When dosai was combined with redgram dhal sambar, the protein content was 27.5g and it also contains 18.9g of fat, 1.5g of fibre, 988 K.cal of energy, 131 mg of calcium, 3.9 mg of iron and 9.3 mg of vitamin C.

The wheat preparation namely chapathi and poori was combined with vegetable kuruma and potato masal. When chapathi is combined with vegetable kurma it provides 12.1g of protein, 15.4g of fat, 2.7g of fibre, 540 K.cal of energy, 112 mg of calcium, 4.4 mg of iron and 2.8 mg of vitamin C.

When chapathi is combined with potato masal it contains 11.6g of protein, 10.3g of fat, 1.3g of fibre, 486 K.cal of energy 66 mg of calcium, 4.8 mg of iron and 2.3 mg of vitamin C.

In the poori and vegetable kuruma combination it gives 12.1g of protein 28.4g of fat, 3.4g of fibre, 620 K.cal of energy, 119 mg of calcium, 5.5 mg of iron and 208 mg of vitamin C.

When poori is combined with potato masal, it provides 11.6g of protein, 23.3g of fat, 2.0g of fibre, 386 K.cal of energy, 73 mg of calcium, 5.9 mg of iron and 2.3 mg of vitamin C.

The remaining three receipes namely pongal, wheat uppuma and kitchidi were combined with coconut chutney. When pongal is combined with coconut chutney it is calculated as the protein content of this 28.2g and also it supplies 67.2g of fat, 3.5g of fibre, 1444 K.cal of energy, 113 mg of calcium, 5.6 mg of iron, 5.6 mg of vitamin C.

In the combination of wheat uppuma and coconut chutney, it supplies 20.4g of protein, 60g of fat, 5.6g of fibre, 1260 K.cal of energy, 136 mg of calcium 5.8 mg of iron and 12.8 mg of vitamin C.

In kitchidi and coconut chutney combination, the protein content was found to be 18.14g and 19.0g of fat, 4.0g of fibre, 878 K.cal of energy, 172 mg of calcium, 5.8 mg of iron and 7.0 mg of vitamin C were present.

From the above table the following aspects are predicted:

- 1 In the two combinations selected for idli, the combination with coconut chutney was found to be the best as it contained comparatively more nutrients than the other combination. But for low calorie diet and weight reduction diet this can be restricted and the second combination can be preferred.

2. With regard to the two selected combinations of dosai, to get more nutritious combination, dosai with coconut chutney was found to be best for every normal individual. It is better to avoid this for the patients suffering from obesity, diabetes, CHD and hypertension.
3. In the case of chapathi preparation, chapathi with vegetable kurma seems to be better since it contains more protein, fibre, energy and calcium when compared to the other combination namely with potato masal.
4. The next combinations namely poori with vegetable kuruma and poori with potato masal, the first one was acceptable because of its nutrient content especially the vitamins and minerals along with energy.
5. Among three combinations selected namely pongal, wheat uppuma and kitchidi with coconut chutney, pongal with coconut chutney seems to have more amount of energy, fat and protein. This may be due to the greengam dhal and ghee added to the preparation of pongal. In the wheat uppuma combination it provides maximum amount of fibre. So this can be recommended for high fibre diet

So this ready reckoner table formulated can be used for the normal individuals, deficiency conditions and disease conditions.

Summary and Conclusion

SUMMARY AND CONCLUSION

The present study entitled "Assessing the Nutrient content of Selected South Indian breakfast items" has the main objectives :

1. To choose the Common breakfast items
2. To standardise the Selected breakfast items
3. To calculate and analyse the nutrient content of the selected dishes, and
4. To produce a ready reckoner to show the nutrient content of the selected breakfast items.

The selection of the breakfast items were done by conducting the survey in fifty households. The common items like idli, dosai, coconut chutney, redgram dhal sambar, poori, chapathi, vegetable kuruma, pongal, wheat uppuma, kitchidi were prepared by the families. The above items were selected and prepared in the foods laboratory. The items were prepared three times and the best variation was accepted by conducting sensory evaluation tests using 5 panel members. The results obtained were summarised as follows :

1. Out of the three variations used for idli preparation, it has been proved that the ratio between the rice and blackgram dhal must be 1:4 to obtain good quality and highly acceptable products

2. The second variation using 50 g of blackgram dhal with 200 g of rice was found to be highly acceptable.
3. Among the three variation used for the preparation of chapathi, second variation with 60 g of wheat flour and 40 g of maida flour was found to be highly acceptable.
4. The first variation used for poori preparation with 80 g of wheat flour and 20 g of maida flour was found to be the suitable mixture.
5. Regarding the variations used for kitchidi preparation the second one was evaluated as the best preparation.
6. In the case of wheat uppuma, the third variation, using 100 g of wheat ravai, and 40 g oil was found to be the best one and highly acceptable product.
7. The first variation using 100 g of raw rice and 40 g of greengram dhal for pongal was highly acceptable.
8. Among the three preparations of coconut chutney, the first preparation with score of 14.8 was selected as the accepted product.
9. In the case of redgram dhal sambar preparation, the first variation was selected as a standard preparation.

10. The first variation used for vegetable kuruma was found to be the best product. It has the maximum score of 14.5.
11. Among the three varieties of potato masal prepared, the first variation with score of 14.6 for 15 was selected as the best product by the panel members.

Nutrient content of raw ingredients were calculated for the selected breakfast items. The individual recipe was combined with side dish and the total nutrient content of the combination is given. The combinations are Idli and coconut chutney, Idli with redgram dhal sambar, Dosai and coconut chutney, Dosai and redgram dhal sambar, chapathi with vegetable kuruma, chapathi and potato masal, poori with vegetable kuruma, poori and potato masal and the remaining dishes namely pongal, wheat uppuma and kitchidi were individually combined with coconut chutney.

Quantitative analysis of selected nutrients for the breakfast items was calculated. Nutrients like energy, protein, fat, fibre, calcium, iron and vitamin C were estimated for the standard product.

Comparison of the calculated value with the analysed value was done for the prepared item. From the comparison it was identified that during cooking and

analysing there may be loss of nutrients. There may be maximum loss of vitamin C and minimum loss of energy, because of their characteristics. There may be percentage difference in iron and calcium. The loss may be more in case of iron, when compared with calcium. Fat and protein was analysed by directly putting the sample. So the loss shown may be due to cooking only. With regard to fibre the loss may differ from one item to another item.

A ready reckoner table was formulated for the selected breakfast preparations. This ready reckoner was formulated for the public to be aware of quality and quantity of nutrients present in each item/combination. This helps the public to know the exact amount of nutrients present in each combination.

People are interested in planning, preparing and consuming attractive, appealing, colourful and tasty dishes without knowing or understanding the facts of food science, cooking loss and the availability of nutrients.

So, the ready reckoner table will be of use to the public in meeting their body needs of varied nutrients.

Recommendations

1. The same study can be repeated to prepare a ready reckoner table for the other meals, festival dishes, dinner items and party preparations.

2. The ready reckoner table can be used for the preparation of Hospital diets.

3. The ready reckoner table helps to make the people to aware of their own food intake both in quality and quantity wise.

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Appendices

APPENDIX - I

INTERVIEW SCHEDULE

Assessing the Nutrient content of Selected South Indian Preparations

1. Name of Interviewer :

2. Name of Interviewee :

3. Date of Interview :

4. Address :

5. Sex :

6. Occupation :

7. Income :

8. Veg. or Non Veg. or Ova Veg:

9. How much do you spend on your food per month :

10. Do you plan ahead the items before

Yes :

No :

If yes, how will you plan

Weekly :

Previous day :

11. Do you give importance / preference on the likes and dislikes of your family members

Yes :

No :

12. Whether you give preferences on cooking the food based on

a) Seasonal

b) Likes and dislikes

13. List out common breakfast items prepared by your family members

a.

d.

g.

b.

e.

h.

c.

f.

i.

14. What are the items you prepare often ?

15. List the items you think as best combinations as breakfast items.

APPENDIX - III

ESTIMATION OF NITROGEN

Principle

The standard method for the determination of nitrogen is the conversion of nitrogen present in the sample into ammonium sulphate. By boiling the concentrated sulphuric acid and subsequently decomposing the ammonium sulphate by means of an alkali such as sodium hydroxide to liberate ammonia. The liberated ammonia is absorbed by boric acid solution and titrated against N/70 sulphuric acid using a mixed indicator. The protein content is then determined by multiplying the value by 6.25.

Procedure

Digestion: 0.1gm of given food stuff was weighed accurately and transferred into a microkjeldahl flask. 0.5ml of concentrated sulphuric acid was added, a pinch of copper sulphate and potassium, sulphate mixture was also added as a catalyst. This digested until a colourless solution was obtained. Made up microkjeldahl flask and only sulphuric acid was taken and digested as before. This was taken as the blank solution.

Distillation: 5 ml of the boric acid was pipetted out in a clean conical flask, added about 2 drops of a mixed indicator. The apparatus was washed with distilled water.

The conical flask containing the boric acid was kept under the container. 5 ml of the blank solution was pipetted out into a distillation chamber through the funnel. Then added 10 ml of 40% sodium hydroxide into the same. Washed the funnel with a few ml of distilled water and closed the pinch cork. The steam generator was heated. The steam was generated and heated the mixture in the distillation flask and ammonia was liberated. The ammonia was collected by the basic acid solution. The solution turned blue the distillation was continued for 5 minutes, after the solution turned blue. The blue coloured solution was titrated against N/70 sulphuric acid taken in the burette till the blue colour disappeared to pink colour. 5 ml of the sample solution was taken and the same procedure was repeated.

S. No.	Volume of boric acid in ml.	Burette reading		Volume of N/70 H_2SO_4
		Initial	Final	

Calculation

Blank titre value

Sample titre value

Actual amount of N/70 H_2SO_4 acid needed to neutralise NH_3 is

1 ml of the N/70 H_2SO_4 acid is equivalent to _____mg
of nitrogen.

_____ml of N/70 H_2SO_4 acid is = _____mg of nitrogen

5 ml of sample solution contains _____mg of nitrogen

0.1 gm of the food stuff contain the same value

_____g of the food stuff contain the _____mg of
nitrogen

1 mg of nitrogen is equivalent of 6.25mg of protein

_____mg of nitrogen equivalent to _____

Estimation of Lipid

Procedure

Washed and dried the soxhlet apparatus. The weight of the round bottom flask was taken. Then 5 g of the sample was taken in a thimble. Ether was taken in the round bottom flask and the extraction of lipid was carried out. Repeated the extraction 3 times. Evaporated off the ether from the flask and dried the lipid in the flask at 60° C overnight. Weighed the flask again and from the difference in weight the percentage of content was calculated.

Calculation

Weight of the empty flask	=
Weight of the flask and lipid	=
Weight of the lipid	=
100 gms of sample contains	=
The percentage of lipid present in	
___g of sample is	=

Determination of fibre content

Principle

By the term crude fibre is meant in food analysis, the combustible residue that is left after the other carbohydrate and the treatments with boiling acids and alkali. This residue is largely cellulose and consists of carbohydrates not assimilable by humans.

Apparatus needed

Weighing balance, beaker, glass rod funnel, muslin cloth, burner and wire gauze.

Reagents needed

1. 0.255N H_2SO_4 :
0.9 ml of H_2SO_4 in 99.1 ml of water
2. 0.313 N NaOH:
0.8 g of NaOH in 99.2 ml of water
3. Ether and Alcohol

Procedure

5 g of the sample was weighed into 500 ml beaker and 200 ml of boiling 0.255N H_2SO_4 was added. The mixture was boiled for 30 minutes keeping the volume constant by adding water at frequent intervals (a glass rod inserted in a beaker helps smooth boiling). At the end of this period the mixture was filtered through a muslin cloth

Determination of energy value of foods using parr oxygen bomb calorimeter

Principle

The principle behind the working of bomb calorimeter is based on the fact that a known weight of the sample if completely burnt in the apparatus permits the heat developed by the combustion to be absorbed by a definite weight of water. By determining the rise in temperature it is possible to calculate with in close limits the number of heat units liberated.

Equipments required

Parr oxygen bomb calorimeter, analytical balance, weight box.

Description of the apparatus:

1. An oxygen bomb calorimeter consisting of three essential parts namely, the bomb or vessel in which the combustible charge is burnt.
2. The calorimeter bucket or the water container holding a measured quantity of water in which the bomb thermometer and the shirring device are immersed.
3. The jacket for protecting the calorimeter bucket from the effects of variation in room temperature.

The bomb consists of strong thick walled metal vessel with a mechanically seated cover which can be removed for cleaning and for inserting the sample. The apparatus works

at a normal pressure of 100 atmosphere. The air which is trapped in the bomb when it is closed contains nitrogen and in the pressure of oxygen at a high temperature and pressure developed, with in the bomb some of nitrogen oxides and combines with water vapour to form nitric acid. Likewise if the samples being burnt contains sulphur that is converted to sulphurous and sulphuric acids. These several acid combines to form a corrosive mixture which with residual oxygen gas at high temperatures generates an atmosphere which will corrode the ordinary metals there are two electrodes attached to the underside of the double valved head. Both electrodes serve as binding posts for the flux wire which is strong between them and down in contact with the food which encloses simplified ignition circuit. The calorimetric bucket provides for total immersion of bomb in a measured quantity of water. It must have a constant stirrer running at constant speed to circulate the water for rapid absorption of heat liberated by the bomb and to maintain temperature equilibrium throughout the bucket. All parr calorimeter are furnished with solid stem mercurial thermometers, made according to highly developed specifications which assure the greatest possibility accuracy and ease in reading.

Procedure

The food was weighed and taken in a capsule 11 cm of the fuse wire was attached and the capsule was placed in

loop electrode, the bomb was assembled and oxygen was filled with 15 atmosphere 2 litres of distilled water which was cooled to 2°F below the room temperature was taken in the calorimeter bucket. The calorimeter was then closed. The thermometer was inserted and the shearing mechanism was started while the terminal were attached to the bomb it was allowed to run 2 minutes before taking the temperature. The temperature reading were recorded at 1 minute intervals for an initial period of 5 minutes. Exactly at the 5th minute the wire was ignited and the button was held for 15 second interval there after until 2 minutes have elapsed when the reading were taken at 1 minute interval. After the maximum was reached the temperature was noted every 1 minute for 5 minutes. The calorimeters was opened, the bucket and the bomb removed. Residual pressure was released. Then the bomb calorimeter cover was released. Then the Bomb calorimeter cover was taken out. The combusted pieces of the fuse wire were removed from the electrodes. They were removed from the electrodes. They were straightened and the length of all the pieces combined to make the fuse wire connection. All the inner surface of the bomb, cylinders and cover were rinsed.

Estimation of Calcium

Principle

Calcium present was precipitated with ammonium oxalate to calcium oxalate by the addition of ammonium oxalate. The precipitate is washed and dissolved in sufficient amount of dilute sulphuric acid and titrated against standard potassium permanganate.

Apparatus needed

Beaker, funnel, standard flask, burette, glass rod, wooden stand, conical flask and filter paper.

Reagent needed

1. Methyl red
2. Strong Ammonia
3. Glacial Acetic Acid
4. 2N H_2SO_4 : Add 55 ml of Conc. H_2SO_4 to 945 ml of distilled water (Cooling is needed)
5. 0.1N $KMnO_4$ (Stock): Dissolved 3.610g of potassium permanganate in 1000 ml of distilled water
6. 0.01N $KMnO_4$: Dilute 10 ml of stock to 100 ml of distilled water.
7. Ammonium Oxalate : Ammonium Oxalate was dissolved in 200 ml of water till it was saturated.

Procedure

5g of food sample was ashed by ignition concentrated or diluted ash from the ignited sample was

dissolved in Hydrochloric acid and made upto 100 ml. 10 ml of prepared ash solution was pipetted out in a clean conical flask and added 90 ml of distilled water. One or two drops of methyl indicator is added, which changes the colour to pink. The mixture was neutralised with ammonia till pink colour changes to yellow. The solution was heated to boil and 10 ml of saturated Ammonium Oxalate was added. The mixture was then allowed to boil for a few minutes and glacial acetic acid was added till the colour of the solution was distinctly pink.

The mixture was kept aside in a warm place and when the precipitate settled down, the supernatant was tested with a drop of ammonium oxalate solution, to ensure the completion of the precipitation. The precipitate was then filtered through watmann filter paper number 40 or 42 and washed with warm water till free of oxalate. The precipitate was transferred to a beaker by making hole in the filter paper and pouring over it dilute H_2SO_4 about 5ml. The solution was then heated to about $70^\circ C$ and titrated against N/100. $KMnO_4$ solution (0.01N). The appearance of pale pink colour was the end point (1ml of 0.01N $KMnO_4$ contains 0.2mg of calcium).

Calculation

Ash solution vs 0.01N $KMnO_4$

Sl. No.	Volume of ash solution(ml)	Burette reading		Volume of $KMnO_4$ (ml)	Indicator
		Initial	Final		

1 ml of 0.01N Potassium Permanganate =
_____ml of 0.01N potassium permanganate =
10 ml of Ash solution contains =
100 ml of Ash solution contains =
5g of sample contains =
100g of sample contains =

ESTIMATION OF IRON

Principle

Iron as ferric ions reacts with ammonium thiocyanate or with Potassium thiocyanate to give ferric thiocyanate which is red in color. The color which is measure of the concentration is determined colorimetrically.

Apparatus needed

Volumetric flask, test tubes, klett, pipette etc.

Reagents needed

1. 30% sulphuric acid
Take 30 ml of conc. H_2SO_4 and dilute it to 100 ml
2. Saturated Potassium Persulphate
Dissolve 7g of potassium persulphate in water and make up to 100 ml.
3. Potassium thiocyanate (40% solution)
Weigh 40 g of potassium thiocyanate and dissolve in 96 ml of distilled water and add 4 ml of acetone and made volume upto 100 ml.
4. Standard Iron solution
70.2 g of ferrous ammonium sulphate was dissolved in 100 ml distilled water. Then after the addition of 4 ml of 1% HCL acid, the solution was made upto 100 ml and mixed thoroughly.
5. Working standard iron solution
Prepared a working standard in 100 ml Volumetric flask by adding 10 ml of stock iron solution and diluted to

the mark with distilled water.

Note:

In iron estimation all the reagents used should be free from iron. Use the glass instead of metal ware. Distilled water is preferred. It uses of reagents containing traces of iron cannot be avoided, it should be seen so that the final solution of standard and test contain identical quantities of those reagents (containing iron as impurities).

Procedure

5g of the food sample was ashed by ignition. When ashing has been completed 5 ml of hydrochloric acid was added and made upto 100ml in a volumetric flask.

Took different aliquots of the standard solution (1ml, 2ml, 3ml, 4ml and 5ml) corresponding to 10r, 20r, 30r, 40r and 50r in a series of test tubes. 3ml of unknown solution was taken into two test tubes. Added 1.0 ml of 30% sulphuric acid, 1 ml of potassium persulphate and 1.5 ml of potassium thiocyanate to all the test tubes. This was made upto 10ml with distilled water.

A blank was prepared by adding all the reagents except standard or unknown solution. Allowed the colour to develop of 20 minutes and the intensity was read at 530 to 540 nm filter in the colorimeter.

Solution Volume ml	Conc %	Volume of potassium per SO ₄ (ml)	Volume of 30% H ₂ SO ₄ (ml)	Volume of distilled water(ml)	Volume of potassium thiocyanate	Klett read- ing
--------------------------	-----------	--	---	-------------------------------------	---------------------------------------	-----------------------

Blank

Standard

1.

2.

3.

4.

5.

Unknown

1.

2.

3 ml of unknown solution has _____ of Iron

100 ml of unknown solution has

5 g of the sample was used to make 100 ml of the solution

i.e. 5 g of sample has =

=

= _____mg of Iron.

ESTIMATION OF VITAMIN C - BY DYE METHOD

Principle

Vitamin C is a good reducing agent and it reduces the dye 2,6, dichlorophenol into phenol. In this reaction vitamin C itself is oxidised to dehydroascorbic acid in the absence of interfering substances, the capacity of an extract of the sample to reduce a standard solution of the dye as determined by titration is directly proportional to vitamin content. Oxalic acid is not only used to reduce the pH of the extracting medium there by stabilising vitamin C, but also to form complexes with metallic iron there by preventing the catalytic oxidation of vitamin C.

Apparatus needed

Centrifuge, Mortar and Pestle, beaker, pipette, burette, flask, funnel.

Reagents needed

1. 2,6 dichlorophenol indophenol
2. Oxalic acid crystals
3. Standard ascorbic acid
4. Sodium bicarbonate

Preparation of reagents

1. 2,6, Dichlorophenol indophenol

Dry weighed 42 mg of sodium bicarbonate and 52 mg of 2,6 dichlorophenol indophenol dry powder and dissolve

sodium bicarbonate and 2,6 dichlorophenol indophenol in 50 ml of water. This was diluted to 200 ml of filtered and stored in refrigerator not more than three days.

2. 4% Oxalic acid

Dissolve the 100 mg of pure vitamin C in 100 ml of 4% of oxalic acid solution in a volumetric flask.

Calculation of Dye factor

Pipette out 10 ml of standard vitamin C solution into a clean conical flask and then added 25 ml of 4% oxalic acid from that 5 ml is pipetted out into a conical flask. The conical flask is placed in the container and the contents were titrated against dye in the burette. The end point was the appearance of pink colour which persisted for 5 seconds. The amount of dye consumed is equivalent to the ascorbic acid present.

Procedure

3 gm of the sample was weighed and soaked in 4% oxalic acid for 10 minutes. This was ground in a mortar and transferred into centrifuge tube. More oxalic acid was added to the centrifugal tube and centrifuged and supernant clear liquid was transferred into a 100ml standard flask. This was made upto the mark (100ml) with 4% oxalic acid.

The dye was taken in a burette and titrated against 5ml of the extract in a beaker. The titration was repeated till concurrent values are obtained.

Calculation

Extract 2,6 Dichlorophenol indophenol

No.	Volume of extract (ml)	Burette reading		Volume of dye (ml)
		Initial (ml)	Final (ml)	

- 1.
 - 2.
 - 3.
-

1 ml of the dye is reduced by 0.157 mg of Ascorbic acid

_____ ml of the dye is reduced by _____ =

5 ml of the extract contains _____ mg of Ascorbic acid

100 ml of the extract contains _____ =

100 ml of the extract was made from 3 g of food sample

_____ of food sample contains _____ mg of ascorbic acid

100 g of food sample contains _____ =

= _____ mg of ascorbic acid

APPENDIX - IV

1. IDLI

Ingredients:

Rice, parboiled	- 200 g
Blackgram dhal	- 50 g
Salt	- 1 teaspoon (5g)

Method:

Soak rice and blackgram dhal separately. Wash and grind these separately to a smooth paste adding water. Mix these ground pastes and add salt and keep overnight for fermentation of the batter dough. Prepare Idli rising the Idli steamer.

2. DOSAI

Ingredients:

Rice, Parboiled	- 200 g
Blackgram dhal	- 50 g
Salt	- 1 teaspoon
Oil	- 14 g.

Method:

Soak rice and blackgram dhal separately. Wash and grind these separately to a smooth paste adding water. Mix these ground pastes and add salt and keep overnight. The batter will raise up and get sour. Take the batter in a spoon and spread it on a hot iron pan till cooked on both sides.

3. COCONUT CHUTNEY

Ingredients:

Grated coconut	-	50 g
Puffed Bengalgram dhal	-	25 g
Green chillies	-	5 g
Red chillies	-	1 g
Corriander leaves	-	1 g
Curry leaves	-	1 g
Salt	-	to taste
Oil	-	2 g

Method:

Grind all the ingredients and season it with oil and curry leaves.

4. REDGRAM DHAL SAMBAR

Ingredients:

Redgram dhal	-	25 g
Small Onion	-	15 g
Big Onion	-	15 g
Tamarind	-	2 g
Tomato	-	30 g
Oil	-	5 g

Method:

Boil the dhal and Mash it. Add turmeric powder, salt and chilli powder. Season with small onion, big onion and tomato. To this add the mashed dhal. Add diluted tamarind pulp to the above mixture. Boil it for ten minutes.

5. CHAPATHI

Ingredients:

Wheat flour	- 60 g
Maida flour	- 40 g
Salt	- 3 g
Oil	- 5 g

Method:

Take the Wheat flour in a mixing bowl, add salt and mix into a loose dough by adding water. Knead well. Leave the dough for one hour. Divide into 8 balls and roll each ball into a Chapathi. Cook it on a hot iron pan. On both sides and finally puff them. Smear it with oil.

6. POORI

Ingredients:

Wheat flour	- 80 g
Maida flour	- 20 g
Salt	- 3 g
Oil	- 20 g

Method:

Mix the wheat flour, water and salt. Prepare the dough. Divide into 8 balls and roll into small pooris. Fry it in oil till it gets puff and golden brown in colour.

7. MIXED VEGETABLE KURUMA

Ingredients:

Beans	- 25 g
Carrot	- 25 g
Potato	- 25 g
Tomato	- 10 g
Green chillies	- 5 g
Curry leaves	- 1 g
Turmeric	- 1 g
Coconut	- 15 g
Small Onion	- 15 g
Salt	- to taste
Big onion	- 15 g
Oil	- 5

Method:

Boil vegetables. Grind coconut, curry leaves into smooth paste. Heat oil in the pan. Season with chillies, curry leaves, tomato, small onion and big onions. Add the ground coconut paste in the pan. To this add all the vegetables together. Boil this with salt and turmeric powder.

8. POTATO MASAL

Ingredients:

Potato	- 50 g
Big onion	- 25 g
Small onion	- 25 g
Tomato	- 10 g
Green chillies	- 5 g
Curry leaves	- 1 g
Salt	- 2 g
Oil	- 5 g
Mustard	- 1 g

Method:

Boil the potatoes for 10 minutes. Peel out the skin. Mash the potatoes. Add salt, turmeric powder. Heat oil in a pan. Season with mustard, small onion, big onion, tomatoes, chillies and curry leaves. Add the mashed potatoes and little amount of water and boil it for 10 minutes.

9. PONGAL

Ingredients:

Raw rice milled-	100 g
Greengram dhal -	20 g
Cashewnut	- 10 g
Pepper-dry	- 4 g
Ghee	- 10 g
Oil	- 20 g

Method:

Fry greengram dhal in a teaspoon of oil till goldern brown in colour. Boil the water and add washed rice and roasted greengram dhal to boiling water. Cook till soft and add salt, pepper. Stir occasionally to prevent charring. When the water has nearly evaporated remove from fire and add fried cashewnuts and ghee.

10. WHEAT UPPUMA

Ingredients:

Wheat ravai	-	100 g
Curry leaves	-	4 g
Corriander leaves	4 g	
Big onion	-	60 g
Mustard seeds	-	4 g
Green chillies	-	40 g
Oil	-	60 g
Salt	-	to taste

Method:

Heat oil in a vessel. Fry mustard chopped onions, green chillies, curry leaves and corriander leaves. Add double the amount of water and salt and allow to boil. Add ravai when water is boiling. Stir well to avoid lumping. Cook till soft.

11. KITCHIDI

Ingredients:

Wheat Semolina	- 40 g
Wheat vermicelli	60 g
Peas	- 20 g
Curry leaves	- 2 g
Carrot	- 30 g
Big onion	- 30 g
Beans	- 30 g
Green chillies	- 10 g
Tomato	- 10 g
Oil	- 20 g
Salt	- to taste

Method:

Boil the vegetables and keep it aside. Heat oil in a vessel. Season with chopped onions, green chillies, tomato mustard and curry leaves. Add water and salt. Boil it and add wheat semolina. Cook it for few minutes add all the boiled vegetables and again add wheat vermicelli. Cook it for some more time till soft. Decorate it with curry leave.

APPENDIX - V

1. Calculation of Raw Ingredients - Idli

Ingredients	Wt. g	Protein g	Fat g	Fibre g	Energy Kcal	Calcium mg	Iron mg	Vitamin C mg
Rice	200	12.8	0.8	0.4	692	18	2	0
Blackgram dhal	50	12	0.7	0.4	173	77	1.9	0
Total		24.8	1.5	0.8	865	95	3.9	0

2. Calculation of Raw Ingredients - Dosai

Ingredients	Wg. g.	Protein g.	Fat g	Fibre g	Energy Kcal	Calcium mg	Iron mg	Vitamin C mg
Rice	200	12.8	0.8	0.4	692	18	2	0
Blackgram dhal	50	12	0.7	0.4	173	77	1.9	0
Oil	13	--	13	--	117	--	--	--
Total		24.8	14.5	0.8	982	95	3.9	0

3. Calculation of Raw Ingredients - Chapathi

Ingredients	Wg. g	Protein g	Fat g	Fibre g	Energy Kcal	Calcium mg	Iron mg	Vitamin C mg
Wheat flour	60	7.2	1.0	1.1	204.6	28.8	2.9	0
Maida	40	4.4	0.3	0.1	139.2	9.2	1.08	0
Oil	5	--	5	--	45	--	--	0
Total		11.6	6.3	1.2	388.8	38	3.98	0

4. Calculation of Raw Ingredients - Poori

Ingredients	Wg. g	Protein g	Fat g	Fibre g	Energy Kcal	Calcium mg	Iron mg	Vitamin C mg
Wheat flour	80	9.6	1.3	1.5	272.8	38.4	3.9	0
Maida	20	2.2	0.1	0.05	69.6	4.6	0.5	0
Oil	20	--	20.0	--	180	--	--	0
Total		11.8	21.46	1.55	522	43.0	4.42	0

5. Calculation of Raw Ingredients - Coconut Chutney

Ingredients	Wg. g	Protein g	Fat g	Fibre g	Energy Kcal	Calcium mg	Iron mg	Vitamin C mg
Roasted bengalgram dhal	25	5.6	1.3	0.2	92.25	14.5	2.3	0
Corriander leaves	1	0.03	0.006	0.012	0.4	1.8	0.01	1.3
Curry leaves	1	0.06	0.01	0.06	1.08	8.3	0.009	0.04
Coconut	50	2.25	20.8	1.8	222	5	0.85	0.5
Green chillies	5	0.14	0.03	0.34	1.4	1.5	0.2	5.5
Red chillies	1	0.15	0.06	0.30	2.5	1.6	0.02	0.5
Total		8.23	22.2	2.71	320	32.7	3.3	7.84

6. Calculation of Raw Ingredients - Redgram dhal sambar

Ingredients	Wg. g	Protein g	Fat g	Fibre g	Energy Kcal	Calcium mg	Iron mg	Vitamin C mg
Redgram dhal	25	5.5	0.4	0.3	83.7	18.25	0.6	0
Onion small	15	0.2	0.01	0.09	8.8	6	0.18	0.3
Onion Big	15	0.18	0.01	0.09	7.5	7.5	0.09	1.6
Tamarind	2	0.06	0.002	0.1	5.6	3.4	0.3	0.06
Tomato	30	0.2	0.06	0.24	6	14.4	0.19	8.1
Oil	5	--	5	--	45	--	--	--
Total		6.14	5.48	0.82	156	49	1.36	10.06

7. Calculation of Raw Ingredients - Vegetable Kuruma

Ingredients	Wg. g	Protein g	Fat g	Fibre g	Energy Kcal	Calcium mg	Iron mg	Vitamin C mg
Curry leaves	1	0.06	0.05	0.02	3.5	1.5	0.6	0
Potato	25	0.4	0.02	0.1	24.2	2.5	0.12	4.25
Onion big	15	0.18	0.01	0.09	7.5	7.5	0.09	1.6
Onion small	15	0.2	0.01	0.09	8.8	6	0.18	0.3
Carrot	25	0.2	0.05	0.3	12	20	1.2	0.75
Beans	25	0.8	0.1	0.8	4	32.5	0.2	2.2
Coconut fresh	15	0.6	6.2	0.5	66.6	1.5	0.2	0.15
Green chillis	5	0.1	0.03	0.3	1.4	1.5	0.2	5.5
Turmeric	1	0.06	0.05	0.02	3.5	1.5	0.6	0
Tomato	10	0.09	0.02	0.08	2	4.8	0.06	2.7
Oil	5	--	5	--	45	--	--	--
Total		2.69	11.5	2.38	177	79.3	3.45	17.45

8. Calculation of Raw Ingredients - Potato Masal

Ingredients	Wg. g	Protein g	Fat g	Fibre g	Energy Kcal	Calcium mg	Iron mg	Vitamin C mg
Curry leaves	1	0.06	0.01	0.06	1.09	8.3	0.009	0.04
Onion big	25	0.3	0.02	0.15	12.5	11.7	0.15	2.7
Onion small	25	0.45	0.02	0.15	14.7	10	0.3	0.5
Potato	50	0.8	0.05	0.2	48.5	5	0.24	8.5
Mustard	1	0.2	0.4	0.01	5.46	4.9	0.07	0
Green chillies	5	0.14	0.03	0.34	1.45	1.5	0.2	5.5
Turmeric	1	0.06	0.05	0.02	3.5	1.5	0.6	0
Tomato	10	0.09	0.02	0.08	2	4.8	0.06	2.7
Oil	5	--	5	--	45	--	--	--
Total		2.1	5.61	1.01	134	47	1.6	20.0

9. Calculation of Raw Ingredients - Pongal

Ingredients	Wg. g	Protein g	Fat g	Fibre g	Energy Kcal	Calcium mg	Iron mg	Vitamin C mg
Raw rice milled	100	6.8	0.48	0.20	345	10	0.68	0
Greengram dhal	20	9.8	0.48	0.32	139.20	30.00	1.56	0
Cashewnut	10	4.24	9.2	0.24	119.20	10.00	0.80	0
Pepper-Dry black	4	0.8	0.4	0.80	24.32	36.80	0.80	0
Ghee	10	--	20	--	180	--	--	0
Oil	20	--	40	--	360	--	--	0
Total		21.64	70.56	1.56	1168	86.8	3.84	0

10. Calculation of Raw Ingredients - Wheat Uppuma

Ingredients	Wg. g	Protein g	Fat g	Fibre g	Energy Kcal	Calcium mg	Iron mg	Vitamin C mg
Wheat, Semolina	100	10.40	0.8	0.20	348	16.0	1.6	6.4
Curry leaves	4	0.24	0.04	0.24	4.36	33.20	0.03	5.44
Corriander leaves	4	0.12	0.02	0.04	1.60	7.20	0.04	--
Onion Big	60	0.72	0.04	0.36	30.0	30.0	0.3	44.40
Mustard seeds	4	0.8	1.60	0.04	21.84	19.60	0.28	--
Green chillies	40	1.12	0.24	2.72	11.20	12.0	1.6	0.16
Oil	60	--	60	--	540	--	--	--
Total		13.40	62.74	3.6	957	118	3.88	56.40

11. Calculation of Raw Ingredients - Kitchidi

Ingredients	Wg. g	Protein g	Fat g	Fibre g	Energy Kcal	Calcium mg	Iron mg	Vitamin C mg
Wheat Semolina	40	4	0.32	0.08	139.2	6.4	0.64	0
Wheat Vermicelli	60	5.2	0.24	0.12	211	13.2	1.2	0
Peas	20	1.44	0.02	0.8	18.6	4	0.3	1.8
Curry leaves	2	0.12	0.01	0.12	2.18	16.76	0.018	0.08
Carrot	30	0.26	0.06	0.36	14.4	24	0.3	0.9
Onion Big	30	0.36	0.02	0.18	15	15	0.18	3.2
Beans	30	1	0.2	0.4	14.4	63	0.24	2.7
Green chillies	10	0.28	0.06	0.06	2.8	3	0.4	11
Tomato	20	0.18	0.04	0.16	4	9.6	0.128	5.4
Oil	20	--	20	--	180	--	--	--
Total		12.84	20.97	2.82	599	154.9	3.4	25.08