FOOD PLANNING AND PREPARATION PROCEDURES FOR USE IN THE HOME ECONOMICS COLLEGE CAFETERIA, KARACHI, PAKISTAN

By

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CHAPTER I

INTRODUCTION

In the modern world, health is one of the foremost standards by which the cultural status of a people is rated. This does not mean an absence of illness, but includes a state of physical vigor and mental alertness. Factors more dominant than the maintenance of optimum health, influence the selection of food, yet the satisfaction of optimum health brings many enduring values. The choice of food may also conform to customs: ceremonial, racial, religious, national and familial, and to the acquired likes and dislikes.

Large numbers of surveys and nutrition experiments have demonstrated a need for a definite requirement of certain food components for normal growth and health. It has been proved that eating inadequate kinds and amounts of food causes not only specific diseases but instigates "subcritical" symptoms, associated with poor health, diminished efficiency, and lowered resistance to fatigue and disease.[2] In countries where there is shortage of high quality protein foods, emphasis on eating animal protein as a source of essential amino acids would not be of practical value. Almost all Asiatic countries have diets which are low in animal protein. Kwashiorkor, a protein deficiency disease in childhood, is common in these areas. Pakistan is one of those countries where there exists a shortage of high quality, complete protein foods. A major advance in the science of nutrition was made when it was discovered that for the maintenance of

health the daily dietary protein must contain in adequate amounts the essential amino acids. Animal proteins are superior in biological value to vegetable proteins, as they contain some of all the eight amino acids essential to man.

The present trend in nutrition, in an attempt to meet the protein needs of the growing world, is to use suitable mixtures of vegetable and animal proteins. Also, different plant sources, that are capable of complementing each other's amino acid deficiencies, are used.

Foods are defined (7) as substances that supply certain nutrients when eaten. Wilson et al. (15) divide the physiological function of food into three general categories: the need for food materials to supply energy, the need for food materials to build and maintain the cells and tissues, and the need for food materials to regulate body processes. These needs are satisfied by substances called nutrients which are constituents of the food that man eats. The classification of these nutrients falls in six groups: carbodydrates, proteins, fats, minerals, vitamins and water.

Many foods in their natural state are not fit for human consumption. A change is produced by "processing" and "cooking" food. Mottram and Graham (10) give the twofold object of cooking food: aesthetic, improvement in appearance and flavor thus enhancing the appetite appeal, and hygienic, improvement of sanitary quality and digestibility efficiency. The application of heat in some form or another being the essential part of all ordinary processes of cooking, various studies are conducted to observe the effect of heat upon the differing chemical constituents of food. Ingredients like acids, salts, sugars and other foods when incorporated with a particular food, appreciably change the basic charac-

teristics of that food. Research is finding new and better ways of cooking foods, to retain the highest per cent of nutritive value for human consumption.

An increasing awareness of world nutrition problems is guiding people in food service management in the development and testing of new programs. The managers of food service institutions have now, an opportunity and responsibility to advance the health, welfare and happiness of the nation by serving food of high nutritive quality.

A popular method of mass feeding, now in full use, is the cafeteria system. The purpose of any cafeteria is to serve wholesome and well-cooked food. Cost is a major deciding factor in the choice of food by the consumer. Food service managers today find their positions challenging ones, as problems of food production and service are receiving ever increasing attention. In setting up a standard, quality food has been described as food (11) that has retained as many of its natural properties as possible, is appealing by the skillful use of color, form, texture, arrangement and garnish, and is palatable as determined by odor, temperature, flavor and consistency.

The methods and controls developed by scientific investigations and technological accomplishments are being incorporated with the established art of cookery. A constant and an organized use of these known methods and controls, maintains a consistent production of quality food in quantities, with the least expenditure of time, labor and materials. A scientific approach to quantity cookery involves an understanding of the processing changes, both chemical and physical, that take place in the storage, preparation, cooking, distribution and service of foods.

Statement of Problem

This study is concerned with the identification of principles of nutrition, menu planning, and standardization of some recipes for a group of young Pakistani women eating in a college cafeteria. The data collected is to be used in the organization of a college cafeteria for women, in Karachi, Pakistan.

Justification for the Study

1. One of the important aspects of this study is to identify and attempt to solve some of the administrative problems of a food service manager in a college cafeteria.

2. It is hoped that this study will help the writer in evaluating the situation, in determining some of the needs in the college of Home Economics at Karachi, and will enable her to take decisive action in formulating procedures to use in the operation of a cafeteria for this school.

Limitations of the Study

The limitations in this study are:

1. The food preparation practices will be determined by a personal investigation of some of the cafeterias in the women's dormitories and in the Student Union at the Oklahoma State University.

2. The time factor limits the study to two semesters of work. Too, the plans may be changed in the future to meet the needs of the prevalent situation in Pakistan.

3. The scope of this investigation is restricted to the planning

and adjusting of one week's menu to meet the nutritional needs, the standardization of four quantity recipes and the application of the principles of preparation to some of the foods in these menus. The author will make recommendations of a flexible nature, taking into account the difference in the situations as they exist in Oklahoma and Karachi.

CHAPTER II

REVIEW OF LITERATURE

Recommended Dietary Allowances and Minimum Daily Requirements

In 1940 the National Research Council appointed the Food and Nutrition Board to undertake as one of its most important projects the formation of a group of figures for human requirements in terms of specific nutrients. Published in 1941 the recommendations were based on the evidence then available and were therefore subject to future revisions. The data used in formulating the Recommended Dietary Allowances was, in general, from three sources:

1. Epidemiologic data on the occurrence or absence of disease in relation to various levels of nutrient intake.
2. Data obtained with human subjects in controlled studies deliberately designed for the determination of requirements of a specific nutrient.
3. Studies upon other species - rats, dogs. (1, p. 34).

The Food and Nutrition Board states the purposes of the Recommended Dietary Allowances in the National Research Council Publication 589.

> These allowances are designed to maintain good nutrition in healthy persons in the United States under current conditions of living and to cover nearly all variations of requirements for nutrients in the population at large. (52, p. 1).

The allowances afford a margin of sufficiency above the minimal

requirements. The generous recommendations may not be practical when feeding large groups under conditions of limited food supply or economic stringency.

Variations exist between the Recommended Dietary Allowances and the Minimum Daily Requirements of the Food and Drug Administration, Department of Health, Education and Welfare. Levels that will prevent deficiency diseases are aimed at in the Minimum Daily Requirements of vitamins and minerals. The Code of Federal Regulations (53) published in July, 1957 gives the most recent revision of the Minimum Daily Requirements which, when compared to the Recommended Dietary Allowances, show the following variations:

1. The age groups established for the Minimum Daily Requirements are not as extensive as those of the Recommended Dietary allowances.
2. Variations occur in the ascorbic acid requirement at all age levels.
3. The amount of vitamin D varies for adults.
4. Variations in the calcium, iron and niacin requirements for infants.

There is an insufficient amount of data on the trace elements or vitamins, which are not included in the tabulation. Some of the nutrients not listed are liable to be present in adequate amounts in the usual dietary. In this report the Recommended Dietary Allowance is used as a basis of comparison in checking the nutritive values of food as it will be consumed by an average Pakistani college girl. When planning the menus the author is working toward the goals set up by the National Research Council.

Nutritive Value of Foods

The ever-increasing knowledge of nutrition has developed to the point where it states the need of some half-a-hundred different substances from food. The substances as a group are called nutrients. Stevenson and Miller (12) define nutrients as the substances that are essential for various processes in the body. Each nutrient has specific functions; a nutrient may also work together with several other nutrients to perform the assigned services for the body.

Nutrients are the building materials for new or repaired tissues and are the substances from which the body gets nourishment. Taken in proper amounts and proportions, the nutrients ensure a normal, healthy body that undergoes the structural changes of a life cycle in an orderly manner. Stevenson and Miller (12) classify the nutrients into five categories according to the closely related composition and the use that the body makes of them:

Proteins

fats

and carbohydrates

organic substances that supply calories, amino and fatty acids;

minerals, or inorganic elements,

and vitamins, or chemically unrelated substances.

The recent publication of the food value tables (50) reports the concentration of saturated and unsaturated fatty acids. The figures for the nutrients are averages and are therefore considered absolute values.

Protein

Today, one of the outstanding problems of the world food situation

is the shortage of protein foods. Most seriously affected are the Middle and Far East, and large groups in the European Countries. Where there is a shortage of animal protein there exists a possibility of deficiency diseases. In Pakistan, the restricted amount of complete animal protein could be supplemented by an adequate supply of cereals of incomplete protein content. Allison et al. have studied the problems of supplementation and state that: "A dietary protein, with a poor pattern of amino acids, therefore, must be fed in much higher concentrations than one with a better pattern to produce similar responses in growth." (17, p. 589).

Dietary proteins are hydrolyzed in the gastro-intestinal tract to yield amino acids which are absorbed into the body to become building blocks for the synthesis of tissue proteins. For protein synthesis the body needs some twenty to twenty-two different amino acids. The eight indispensible ones are supplied in the diet. Howard et al. (30) demonstrated the correlation between the dietary level of "complete protein," growth, growth rate, voluntary food intake, and the protein content of the carcass of rats. An inadequate intake may cause certain liver disorders, anemia, sensory neuritis, edema and kwashiorkar. (3).

Pakistan has large fish resources which can be used as an important source of high-quality protein food. There is a great potentiality for the development of fisheries. Higher production and use of fish would improve the protein content of the food of the people. Research is in progress in areas of fish drying and curing methods, and analysis of vitamin content of shark liver oil. Biological studies are concentrated on sardines, mackeral, tuna and the hilsa fish. Hilsa is regarded as one of the most delicious fish of East Pakistan. The nutritive value

(44) of hilsa is high: Protein, 21.52 per cent; calcium, 266.10 mg.; iron, 3.73 mg.; and phosphorus, 22.19 mg. per (44) edible portion. In the words of Dr. Hampton: "There is no doubt that the mass of people who do not get enough protein in their diet, need the fish and that an immense opportunity exists in Africa and Asia to develop this trade." (29, p. 20) Designs have been completed by Food and Agriculture Organization experts for a new fish harbor at Karachi. A frozen shrimp plant is now operating and there is a vast scope for the development of local markets for fish products.

Fish is an excellent source of protein, minerals and vitamins. The mineral content is about the same as in beef, except for iron and iodine. The edible portion of fish varies in fat content from 20 per cent to 0.2 per cent (7). The consumption of fish and other marine products has always been an important factor in the nutrition and economy of the coastal population of East Pakistan. Recently there has been a trend toward increased fish consumption in both sections of the country. Considering the high nutritive value of fish products, it would be beneficial to review studies conducted for analysing the nutrient content. Terri et al. (41) analyzed various species of salt-water fish for moisture, protein, nicotinic acid, riboflavin, and vitamin B_{12}. A study of the amino acid distribution was also made. The salt-water species were found to be similar and in some instances superior to lean meat in nutritive value with respect to the factors studied. The species of particularly high nutritive value included tuna, salmon, mackeral, swordfish and halibut.

Loughlin and Teeri (34) also studied the quantity of biotin, folic acid and pantothenic acid in different species of salt-water fish. With

respect to the vitamins studied many marine species have a high nutritive value. Qualitative work on free amino acids showed the distribution in fish muscle. The most prominent ones consistently present in all species were glutamic acid, glycine, alanine, valine and leucine.

A valuable source of complete and adequate proteins, eggs are appropriately suitable in supplementing such incomplete proteins as those from cereals. Highly nutritious, eggs are frequently served as the main dish in the meal. This procedure is particularly followed on the two meatless days in West Pakistan, when fish, too, dominates the two meals of the day.

Carbohydrates

Carbohydrates form a large proportion of the diets of the Orientals. The seeds of cereals high in carbohydrates, form a staple food almost everywhere. Although carbohydrates function in nutrition primarily as a source of energy, there is no definite nutritional requirement for this nutrient. Cereal grains, the most important source of carbohydrates, are rich in starch. Rice, wheat, sorghum, corn, millet and rye contain about 70 per cent of starch. Cereals and cereal products when eaten in quantity are valuable sources of protein, carbohydrate, thiamine, other B-complex vitamins and certain minerals. The high nutritive value of cereals is accompanied by a bland and agreeable flavor. Cereals play an important role in the low-cost diet. This is particularly true of Asiatic diets where plant proteins are in excess of animal proteins.

Nutritionists consider plant proteins to be generally inferior in nutritional value to animal proteins. Early investigations found cereals to be poor sources of protein in human and animal nutrition,

qualitatively as well as quantitatively. The biological value and the protein efficiency ratio of cereal proteins are inferior to those of animal proteins. Wheat germ, however, is an exception to the rule. The biological value and the protein efficiency ratio of wheat germ protein approach the high values of animal protein. Rand and Collins (37) on treating defatted wheat germ to mild heat, such as steaming and light toasting, found the protein quality to be enhanced considerably. Defatted wheat germ was used to avoid the hydrolytic and oxidative changes in the wheat germ lipids. Nutritionally it would seem possible to supplement wheat flour and other cereals with defatted wheat germ and increase the nutritive value without causing a deleterious effect on the keeping qualities.

Unpolished or brown rice is the whole grain with just the husk removed. Milling and whitening processes remove the bran and produce the polished rice. The removal of the bran affects the food value and the polishing retards deterioration.

Fats and Oils

The term "fats" includes all the edible oils and solid fats extracted from animal and plant sources that are used in food preparation. Fats are partly responsible for the differences in food preparation among different regions of a country and among different countries of the world. A chemical difference between fats and oils is that the fats contain higher percentages of the saturated glycerides than the oils. The unsaturated glycerides are higher in the oils than in the fats. The essential fatty acids are arachidonic, from animal fats, and linoleic and linolenic from plant oils. The solubility of vitamins A, D, E and K in fats has prompted nutritionists to recommend a daily intake of

butter or margarine. Mineral oil, however, curtails the absorption of the nutrients.

An important problem in food preservation is the prevention of rancidity. Chemically, the oxidation of unsaturated fatty acids produces a flavor reversion and inactivation of vitamin A. Vegetable oils and fats are less perishable than animal because they contain natural antioxidants and may be stored at room temperatures for longer periods. Animal fats require refrigeration to retain their fresh flavor except in the case of lard to which antioxidants may be added. In Pakistan a recent development is the fortification of vegetable ghee, a product similar to margarine, with vitamins A and D.

Food fats are valuable, particularly, as concentrated forms of energy. In pure form they yield about 4000 calories per pound, more than twice the fuel value of equal quantities of carbohydrate or protein (14). Justin et al. (7) attribute the importance of fats and oils in the average diet to their "staying qualities" or the slowness with which they are digested. There are many other reasons for the prominent place fats have in the human diet. King presents these in the following manner:

> First, they are associated with good flavors and concentrated energy. Second, they are normally associated with sources of good protein, and these have long been recognized as of crucial importance in relation to human health, as illustrated by meat, fish, milk, eggs and oil-bearing seeds. These foods are also characterized by a high content of vitamins and minerals. (32, p. 66).

Today, certain fatty acids are being recognized as essential for optimum nutrition. The United States Department of Agriculture, in publishing the nutritive value of foods, has included the saturated and unsaturated fatty acid content of all foods. In the 1960 edition of the Nutritive

Value of Foods (50) they give the total saturated, oleic, and linoleic acid in grams per edible part of foods. Quantitative studies on satiety show the contribution of fats to desired physiological balances and the time cycles for eating.

A field of interest in the study of fats and oils is the effect of types of dietary fat on growth and physical health. In experiments conducted with chicks (20) highly significant growth increases were obtained by increasing the vegetable oil content of purified diets from 3-5 to 10 per cent. The growth of chicks fed hydrogenated vegetable oil was less than that of chicks fed an equal quantity of corn oil or soybean oil. This indicated that the growth-promoting effect of the oil was reduced during hydrogenation. Brown (20) determined the effect of corn oil and hydrogenated shortening on reproductive performance and body composition in vitamin B_6-deficient and control female rats. The two types of fat were administered at 15 per cent dieting levels. Rats fed hydrogenated shortening had the lowest cholesterol levels and produced less than half as many live young as those fed corn oil. The study concluded that the more unsaturated fat exerts a protective effect in the vitamin B_6-deficient animals. Also, the adverse effect of the deficiency on fertility and reproductive activity is accentuated when hydrogenated shortening rather than corn oil is the source of dieting fat.

Vitamins and Minerals

General distribution of vitamins in food is studied with regard to the two groups of water-soluble and fat-soluble vitamins. Green leafy vegetables on the whole, have a high content of most vitamins. Also rich in these nutrients are fruits, legumes, whole grain cereals and

root vegetables. Since refined foods, such as highly milled grains, have assumed a more prominent place in the diet, ill health due to vitamin deficiencies has become more prominent. The fat-soluble vitamins are found chiefly in fatty foods--butter, liver, egg yolk and all kinds of fats. Milk has both water-soluble and fat-soluble vitamins.

Vegetables

Vegetables, both green and yellow varieties, are sources of vital vitamins and minerals. The contribution vegetables can make toward meeting the nutritional needs has been recognized for many years. This realization gave impetus to research in vegetable processing, canning, freezing, and cookery. So far as Pakistan is considered, frozen and canned vegetables are not available to an average consumer. Selection of vegetables is made from the fresh varieties.

The Basic Four Food Guide includes in the Fruit and Vegetable group, three different types of vegetables:

1. Vegetables high in Vitamin A. These include the leafy, green or yellow vegetables which contain less than 10 per cent of solid matter. Outstanding members of this group are the various kinds of leafy greens, carrots and sweet potatoes.

2. Vegetables high in vitamin C. These vegetables are grouped with citrous fruits due to the rich vitamin C content. Important sources are tomatoes, turnip greens, green pepper, broccoli, kale, cauliflower, mustard greens and Brussels sprouts.

3. Potatoes and vegetables not included in the above groups: These vegetables contribute many vitamins and minerals to the diet, but are not outstanding in any one nutrient. Onions which form the base of many Pakistani recipes, are actually bulbs.

Fruits

The term "fruit" includes a number of foods ordinarily classed as vegetables, nuts, or grains (7). The fresh fruits are pulpy in contrast to the dried fruits. On the Pakistani market the products commonly classed as fruits include apples, apricots, peaches, pears, plums, papaya, grapefruit, grapes, guava, cantaloupe, berries of all varieties, dates, figs and oranges. The dried fruits and nuts, grouped together, are peanuts, cashew nuts, coconut, currants, raisins, pecans, walnuts and dried fruits, for instance, apricots. The most important contribution of fruit to the diet is its vitamin content, particularly ascorbic acid, best obtained from fresh and citrous fruits. A factor which makes fruits of value in the diet is the bulk furnished by the cellulose and the hemicellulose, which stimulate peristalsis.

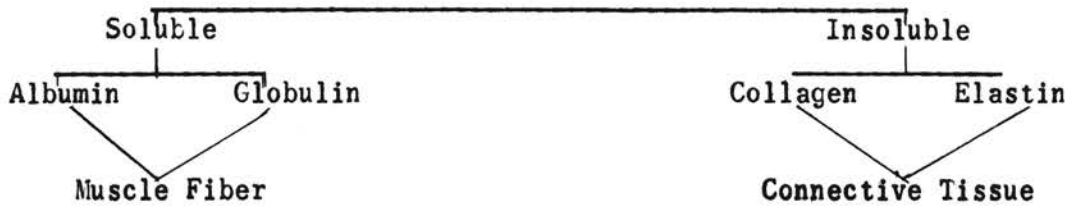
Principles of Cookery

Protein

This study aims to improve the quality of protein in the diet by careful food combinations and the application of principles of cooking for a greater retention of the nutrients. The average Pakistani man and woman use beef and mutton, while the consumption of fish and other sea food is low in the western section of the country. In the east, however, fish takes the precedent over beef and mutton. Certain characteristics of the individual meats and the geographical conditions are partially responsible for the differences in the amounts consumed.

For the application of successful methods of cooking, there is a need of recognizing the characteristics of the different constituents of meat.

Proteins of Meat



Albumin and globulin are soluble in cold water and in dilute acid solutions. Both soluble proteins are coagulated by heat, below the boiling point. Coagulation of albumin begins at about 55°C (131°F) and is completed at about 71°C (160°F). Coagulation of globulin takes place from about 45° to 50°C (113° to 122°F). Boiling water toughens albumin and globulin is hardened by intense heat (7).

The insoluble proteins in the connective tissue are hardened by dry heat. In moist heat, however, a short cooking period does not affect collagen, but a longer cooking time converts it to gelatin, rendering the meat more tender. This change is further hastened in the presence of acids. Elastin, the second insoluble protein remains unaffected even by long cooking in moist heat. The fat, forming a protective layer for the muscle, melts when heated and is lost in varying amounts during cooking. In dry heat cookery the moisture in the meats is retained to a large extent by the protective layers of fat.

Lushbough et al. (35) investigated the vitamin B_6 content of fresh muscle and organ meats and the retention of vitamin B_6 in cooked and processed meats. Paired cuts of meat from the same carcass were selected and one of each pair was roasted until well-done (oven temperature, 325°F; internal temperatures: beef, 170°F; veal and lamb 180°F; pork, 185°F). The fresh and cooked cuts were then boned and all visible fat

removed. The study indicated percentage retention values ranging from 42 to 67 per cent and averaging approximately 54 per cent. The vitamin B_6 present in the drippings from cooked meat represented a relatively small proportion of the total. A major part of this loss was due to the destruction of the vitamin in the meat and in the drippings during cooking. A long stretch of cooking time exposes the meat to a greater loss of vitamin B_6.

Visser at al. (43) studied the effect on the tenderness and juiciness of beef when cooked to rare, medium, and well-done by oven roasting, cooking in deep fat at 110°C, and cooking in deep fat at 100°C. Rate of heat penetration was slower in oven roasts than in roasts cooked in fat. At a given temperature the heat conductivity of liquid fat is about six times that of the air, therefore, curves for roasts cooked in deep fat are steeper and shorter than those for oven roasts. The effect of internal temperature on cooking time and losses was most pronounced in oven roasts and least pronounced in those cooked in deep fat at 110°C.

Consequently, the tenderness of beef cooked in fat at 100°C is lower than the oven roasts or those cooked in deep fat at 110°C. At 100°C meat cooked in the oven and in the deep fat has a greater retention of juices than meat cooked in fat at 110°C. It seems that in a good muscle where the effect of connective tissue is small, the state of contraction is a significant factor in tenderness (33). Other factors affecting the tenderness of beef are the connective tissue content, histological arrangement of muscle fibers, storage, history, ionic balance and water retention.

In Pakistan the tough cuts of many raw meats are tenderized by

marinating with crushed, raw papaya, before cooking. Tappel and Tsen (40, p. 11) found that in comparison to other proteolytic enzymes-bromelin, trypsin, ficin, and rhozyme-papain is more active in hydrolyzing the muscle fiber protein, actomyosin. Collagen and actin are hydrolyzed slowly and to a limited extent. The heat stability of papain allows a maximum hydrolysis of proteins at 60°C or higher.

The characteristic changes produced by cooking meat consist of changes in color, flavor, texture, volume, and structural proteins. Lowe (8) attributes the development of the "meaty" flavor in cooked meat to the breakdown of amino acids of the protein. The "meaty" flavor increases with longer cooking to about 3 hours, then with still longer cooking decreases. Many of the Pakistani meat recipes use a marinade composed of water, acid (tomatoes, yoghart, lemon, vinegar), and seasoning to increase the tenderness and flavor of meat. In an ordinary cooking period there is not sufficient time for the acid to penetrate into the meat and bring about its tendering effect.

In meat cookery considerable work has been done on tenderness of beef as affected by cooking at varying temperatures and for different periods of time. In tender meat, doneness is judged largely by the amount of external browning, development of flavor, internal coagulation of fibers, and change of color. In less tender products, the principal criterion is the development of tenderness as it is associated with the ease of separation of the muscle fibers. Time of cooking rather than the cooking temperature has been suggested by Lowe (8, p. 233) as a determining factor affecting tenderness. Bramblett et al. (19) used very low temperatures for meat cooked for long periods of time. They experimented with five muscles from six pairs of U. S. Standard grade

beef rounds. One of each pair was cooked at 63°C (145°F) for 30 hours and the other cooked at 68°C (155°F) for 18 hours. Meat cooked at 63°C as compared with that cooked at 68°C had a lower percentage of cooking losses and a higher percent moisture content. This result is corroborated by Sweetman (14, p. 414) as being possible within certain limits. However, when the time of cooking is very long at lower temperatures, the weight losses according to Lowe (8, p. 235), would be high during cooking.

Meat is valued primarily for its protein contribution and the proportions of the various amino acids making up the proteins. The amino acid components of meat proteins include all of those known to be essential to man and are hence classified as complete proteins in the diet. Fry and Stadelman (24) initiated a study to determine the effect of cooking chicken meat on the content of methionine and cystine. The distribution of these amino acids in the various segments of the carcass was significantly different. Light meat was highest in methionine and cystine was contained in large amounts in the liver. Skin was found to be lowest in both amino acids. Both methionine and cystine were found to be stable to the effects of cooking by baking in a covered container. During cooking there was an increase in both amino acids. The drip contained very small amounts of methionine and cystine, the remaining amino acids being changed as a percentage of the nitrogen present in the cooked meat. Stevenson and Miller observe:

> Ordinary cooking processes do not appreciably change amino acids in meat proteins, so there is little if any change in the potential protein value of meat caused by the method of preparation. . . .
>
> Cooking methods may indirectly affect the nutritive value of the meat. Deep-fat fried products, for example, may contain too much fat for complete digestion. Hot spices may irritate the digestive tract and prevent efficient absorption of amino acids. (12, p. 58).

The problem of meat cookery involves not only the method of preparation but extends to include the medium of cooking, seasonings and spices. The complete breakdown of protein by digestive processes will aid in the absorption of amino acids into the blood stream. This is the end result toward which a dietition works.

Controlled Preparation Principles and Procedures

Meat

The four general purposes of cooking meat and meat products are:

1. To destroy micro-organisms and make meat safe to use
2. To improve flavor and appearance
3. To coagulate plasma protein
4. To soften less tender cuts and make them tender. The connective tissue is softened, making it more susceptible to the action of digestive juices.

Each country has its own way of preparing meat. Variations in seasonings, length of the cooking period, method of applying heat, together with variations in type of meat make limitless variety in menus. Whatever method of cooking meat is chosen, it will be based on coagulation of protein. Coagulation will be due to the application of heat in either of the following two methods:

1. Dry heat. This method is used for the tender cuts with small amounts of connective tissue. Dry heat cookery includes roasting, broiling and pan-broiling.

2. Moist heat. This method is suitable for the less tender cuts, which have more connective tissue. Moist-heat cookery includes braising, stewing and boiling.

Roasting.--The heat is conveyed to the meat by direct radiation, instead of through the medium of a liquid. Shrinkage occurs causing an extraction of the meat juices. Some juices are evaporated to dryness on the surface of the joint and therefore not lost. From the standpoint of nutritive quality losses in roasting by volatilization and by drippings, are negligible. Volatilization losses consist largely of evaporated water. Losses through drippings include water, melted fat and some minerals and water-soluble vitamins which may be conserved and eaten with the meat. Recommendations for roasting meat:

1. Cooking to the rare stage (20 minutes per pound) increases juiciness and flavor, and results in a larger number of servings than cooking to well-done stage (30 minutes per pound).

2. Unless carefully limited, a high oven temperature at any point in roasting increases losses and shrinkage as compared with lower constant-temperature cooking. The constant-temperature method ensures a greater uniformity of doneness and is easier to control.

3. Tenderness in cooked meat increases with lower oven-temperatures. The following ranges are preferrable for the various kinds of meat:

Veal and lamb	300°F
Beef roasts	300-325°F
Chicken and duck	325-350°F
Whole fish	325°F
Split fish or Fillets	350°F

To tenderize very inferior cuts of meat, a low oven temperature (260°F) is used. In Pakistan the meat is sometimes marinated in crushed raw papaya, an hour before cooking.

4. With the fat side up, or with narrow strips of fat layered on the top surface, there is formed a coating of fat. This usually prevents excessive evaporation, as water does not pass through the layer of fat.

5. A large, compact roast will have a smaller percentage of loss than will a smaller, thin roast under the same conditions. Greater surface area results in greater evaporation.

6. Roasts should be cooked in an uncovered pan. Cooking losses are increased by covering.

7. Doneness is determined by change in color or the degree of coagulation of protein rather than by testing the tenderness. In meat cookery the ideal to be aimed at is the decomposition of the red haemoglobin without overcoagulating the proteins of the meat or removing the flavoring extractives from it.

Broiling.--In broiling heat is applied directly from the source, or by means of hot metal. The latter method is known as pan broiling. Observation of the recommended procedure gives the desirable results in palatability and flavor.

1. Maintenance of a moderate temperature throughout the broiling period causes less decomposition of the fat.

2. Thin cuts and slices from tender cuts of meat are placed about three inches from the source of heat. Steaks, Kabobs, lamb chops and other cuts of approximately one to two inch thickness require a temperature higher than that recommended for roasting beef. A range of 325°-350°F is more likely to give uniform results in surface browning.

3. When sufficiently browned and about half way through the cooking, the steak is turned and cooked on the other side. Turning the

steaks once is recommended for easier handling.

4. Six to twelve minutes are allotted for a steak an inch thick, the time varying with the degree of doneness desired.

5. In pan broiling the accumulated fat is poured off, which would otherwise result in frying.

6. Addition of water or covering the pan transforms the method to braising which gives different palatability qualities.

7. With increased temperature there is a liability of sputtering and smoking. Hence, temperatures for pan-broiling are controlled below the smoking point of fat.

Frying.--Meats cooked in fat are usually browned first and then cooked slowly until tender. The absorption of fat increases the weight of the fried meat. Complete immersion of meat in fat is called deep-fat-frying; cooking in a smaller amount of fat is pan-frying, or sauteing. In all these methods the temperature of the fat is kept below the smoking point.

1. In deep-fat-frying the meat is immersed in hot fat to produce a rapid coagulation of proteins before an excessive amount of fat is absorbed.

2. Temperatures of 350^{o}-375^{o}F seem suitable for deep fat frying chicken, scallops and other pieces of meat.

3. Addition of moist food is apt to produce a frothy layer on the surface of the hot fat.

4. An appreciable decrease in temperature occurs by adding a large quantity of meat at one time. For a uniform cooking the right proportion of meat and fat is required.

Braising.--includes the following steps:

1. Browning the meat in its own or a small amount of added fat.

2. The meat may or may not be dredged with flour.

3. Placing the meat on a rack in a heavy container, lightly covered.

4. Adding a small amount of liquid, juice or cooking the meat in its own juices.

5. Acid in the form of tomatoes, lemon juice or sour cream is generally used in braised meats.

6. A longer time is required to produce tenderness by conversion of the connective tissue to gelatin. However, a too long cooking time is liable to separate the fibers and produce a poor texture.

Stewing.--With its many variations, stewing implies the addition of a liquid to the meat during cooking. The cooking medium for moist heat may be steam or water. The softening of less tender cuts of meat by cooking in moist heat is accomplished to a large extent, by simmering ($200^{o}F$) rather than by boiling. Temperatures above simmering toughen fish which requires only 2 to 7 minutes of simmering. Preliminary browning in a small amount of fat is generally practised before the addition of a liquid. The amount of liquid added depends upon personal preferences. Temperatures as high as $250^{o}F$ are obtained by using pressure sauce pans, which again depends on personal likes and dislikes.

1. Small pieces of meat cooked by simmering (190^{o}-$200^{o}F$) are called stews.

2. Meat for stewing may or may not be browned before the liquid is added.

3. There is practically no difference in the shrinkage produced by cooking meat in already boiling water or starting in cold water.

4. For a rich, highly flavored broth the meat is cut into small

cubes, thus exposing a larger surface area to the liquid.

5. A long, slow cooking ensures maximum flavor and food value in the cooking liquid.

6. Vegetables are often added to stews to enhance their flavor. The common practice among most of the Pakistani families of putting a number of vegetables into the stew and the soup pot and flavoring the mixture with garlic or other seasonings, is a valuable method of conserving the minerals in the food.

Poultry

The cooking of poultry closely resembles the cooking of other meats. The amount of fat varies with the fowl and with the cut. Chicken is low in fat, the white meat containing less fat than the dark meat; a fact in favor of rapid digestion. The method of preparation needs to be adapted to the type and age of fowl selected.

1. Removal of feathers is followed by singeing the hair and washing the bird, both inside and on the surface of its body.

2. The head, feet, entrails and lungs are removed before rinsing completely.

3. The small, young bird is suitable for broiling and roasting; while the older may be selected for frying and stewing.

4. Rolling the bird in flour or in egg and crumbs before frying gives a brown crust which is preferable to many people.

5. Since by roasting uncovered the skin becomes dry and tough, the bird is covered for the last half hour of cooking. The skin is softened by the steam.

6. For a juicy breast meat, the roasting is done with the breast down.

7. The fibers of the meat of poultry being more tender than those of the flesh of animals usually require less mastication, heat and time of cooking.

Fish

A less expensive source of protein than many cuts of meats, fish of a wide variety are available in East and West Pakistan. The short and tender muscle fibers make it an easily digestible food. The general rule for cooking fish may be summed up as follows:

1. Short cooking just before serving is most important. Broiled fish dries out fast after cooking.

2. High temperatures tend to increase the losses and yield a dry and more or less tasteless product.

3. Since acid flavors combine well with fish the use of lemon or a sauce with pungent ingredients is usually recommended.

4. Thorough cooking is indicated when the fish "flakes" or separates easily on being tested with a knife.

Eggs

Favorite ways of cooking eggs are in the shell, poached, baked, fried, in omelets and scrambled. Justin et al. list certain facts applied to the preparation of eggs by any method.

1. The albumin of eggs is soluble in pure water.
2. The albumin, globulin, and ovovitellin are soluble in dilute salt water.
3. Eggs are coagulated by heat.
4. Eggs cooked slowly at low temperatures tend to be more tender.
5. High temperatures toughen the coagulated proteins of eggs.
6. Over cooking, even at low temperatures, results in a tough, dry egg dish.
7. When liquid is added to the eggs, overcooking causes the liquid to be expressed and a curdled mixture results. (7, p. 217).

Principles of egg cookery are similar to those for fish entailing merely

the coagulation of soft proteins. Too slow coagulation produces a very undesirable green color caused by the formation of ferrous sulphide. For minimizing the green color the cooked egg is plunged into cold water immediately after cooking.

This is done to lower the pressure at the shell. It is a known fact that pressure increases with increasing temperature. Hence, with reduced pressure the H_2O, produced by the white, diffuses to the surface of the egg. There is less possibility of H_2O combining with the iron of the yolk to form FeS. (8).

Cooking Eggs in Hot Water.--1. To maintain the shape use hot water to prepare poached egg. The surface of the egg is then coagulated protecting the interior against the solvent action of the water.

2. The poaching liquid should be deep enough to cover the egg entirely.

3. Adding acid to the poaching medium hastens the coagulation of egg proteins by lowering the coagulation temperature.

4. Sugar raises the coagulation temperature.

5. Milk, if used as the poaching medium gives a product of different flavor but with increased food value.

Fried Eggs.--1. For an attractive form the egg must be placed in the skillet round and compact; and in the process of removal the form should not be broken.

2. Add eggs to fat hot enough to produce setting in a few seconds without browning and toughening the white.

3. Spooning a little hot fat over the egg cooks the top surface, or the utensil can be covered.

4. The steam formed, by adding a little water and covering the

utensil, aids in cooking the egg.

Baked Eggs.--1. Place the eggs in individual baking dishes or one large dish with seasonings and crumbs. The crumbs brown and protect the eggs from the direct heat of the oven.

2. Adding a liquid or sauce in adequate amounts moistens the crumbs and adds flavor. The liquid may be milk, cream, tomato sauce or meat stock.

3. Oiling and heating the pans to the desired cooking temperature before the egg is baked, eliminates the possibility of sticking to the pan.

Omelets.--Omelets with no thickening agent such as tapioca, bread crumbs, rice or white sauce, are tender and delicate.

1. Beat the eggs and seasonings together until completely misible.

2. Cook slowly with occasional pricking of the mixture until it is set.

3. For puffy omelets the yolks and whites are beaten separately; the seasoning added to either of the two components.

4. Use of liquid in a puffy omelet gives a larger and more tender product. Recommended proportions are one teaspoon of lemon juice and two teaspoons of water or one tablespoon of tomato juice per egg. Acids in comparison to water yield a more tender product with a large volume.

5. Milk, if used as the liquid, should be added to the yolk. In combination with the white the fat content of the milk prevents whipping, and interferes with foam formation.

6. The beating of the white in a puffy omelet is continued until the foam becomes stiff and the yolks beaten until thick and lemon-colored.

7. The yolks are added to the stiffly beaten whites and folded in thoroughly. An incomplete mixing separates the yolk to form a solid layer at the bottom of the omelet.

8. A change in flavor is obtained by rolling inside the omelet fruits, ground meat or creamed vegetables.

Scrambled Eggs.--1. Beat eggs just enough to mix yolks and whites. Stir in milk, one tablespoon per egg. Liquid, if used in excess, produces curdling due to overcooking of the eggs in an effort to secure thickening.

2. Stir the mixture while cooking over slow heat.

3. A simmering temperature is highly desirable for scrambled eggs. This is obtained by heating over boiling water. The high food value coupled with the general acceptability of flavor and color have found a variety of uses of egg in cookery - thickening, leavening, emulsifying, binding, coating, clarifying, coloring and flavoring. The main consideration in egg cookery is the maintenance of a suitable cooking temperature for the required length of time.

Milk

Primarily functioning as a liquid for beverages, milk is also used in food preparation such as soups, sauces, puddings, frozen desserts, or baked products. On heating fresh milk two changes occur: a film, calcium caseinate, forms on the surface; and the utensil is coated with coagulated albumin.

1. When using direct heat, cook milk in heavy utensils made of metals with good heat-conducting property.

2. Food preparation principles for milk and cheese are based primarily on their protein content. Low cooking temperatures are conducive

to maintaining the soft, tender quality of their proteins.

3. When heated to a high temperature the proteins of milk and cheese become tough and rubbery; also milk scorches easily.

Legumes

The dry, mature seeds of plants known as legumes are included with the study of meats since they contain somewhat similar amounts of many of the same nutrients found in meat. The commonly used legumes are navy, lima, kidney, soy and other varieties of beans, lentils and dried peas. Dried legumes require a longer cooking period than fresh legumes. The common varieties of lentils in Pakistan include mung, masoor, tuwar and chena. Cooking of legumes is necessary from the standpoint of digestion.

1. Soak the legumes for a few hours. Hot water aids in a rapid swelling.

2. Too long a time for soaking initiates fermentation, which can be arrested by keeping the mixture cool.

3. Salting the beans at the end of the cooking period produces a softer texture.

4. The water in which lentils are soaked is used to make dal and soup from the pureed peas and lentils. The amount of water used depends on the desired consistency of the finished product.

5. The bland flavor is improved by seasoning dal and cooking under cover, in a small quantity of fried onions.

6. Time of cooking beans is shorter in a covered than in an uncovered vessel. The cooling effect of evaporation of water at the surface is reduced by covering the utensil.

Carbohydrate

Rice

Rice is a typical cereal which is commonly cooked without breaking the grain. For retention of the original form the excess starch is removed by washing and the amount of liquid used for cooking depends upon the method of cooking. In the orient it is an accepted pattern to wash rice before cooking in order to remove dust and other foreign material. The washed rice is then cooked with water; either in a minimum quantity or with excess water. The former procedure helps in a complete absorption of water by the cooked rice. When in excess, the water (gruel) is poured off after cooking. These three operations of washing, cooking and draining the gruel entail losses of water soluble vitamins, minerals and other nutrients.

A step in this field of research was taken by Malakar and Banerjee (36) to study quantitatively the losses of thiamine, riboflavin, niacin, calcium, phosphorus, iron and nitrogen during washing and cooling of some pure strains of rice with different volumes of water. When cooked with excess water the rice was drained for a definite period of time (10 minutes). Prior to cooking the average percentage losses of nutrients during washing of five pure strains of rice were found to be thiamine 5, riboflavin 17, niacin 9, calcium 10, phosphorus 5, phytin phosphorus 4, iron 21, and nitrogen 23. The average losses (over the loss during cooking) of these nutrients in gruel of rice cooked with 6 and 8 volumes of water respectively were:

thiamine	28%	35%
riboflavin	27%	34%
niacin	30%	39%

	Calcium	17%	25%
	phosphorus	17%	20%
	phythin phosphorus	11%	18%
	iron	18%	24%
and	nitrogen	5%	8%

The loss of nutrients in rice cooked with just sufficient water was negligible. The study also indicated that although cooking with excess water would entail losses in nutrients, such cooking would be desirable where digestion efficiency is poor.

Storage affects considerably the cooking quality of rice. Irwin (49) used a standardized cooking method in testing the cooking quality of milled rice. Samples were stored in a dry storeroom, a glass jar, in a refrigerator and a freezer. Cooking tests showed that the differences due to method of storage were greater than those due to variety. The samples stored in sacks and jars in the dry store room scored higher than those stored in the refrigerator or freezer.

The most common problem encountered in cooking rice is one of retaining the original form and preventing the grain from adhering to one another. The amount of liquid used for rice cookery depends upon the method of cooking. However, the quantity should not exceed the amount required for complete absorption. Rice purchased by the Pakistani consumer contains foreign material that needs to be separated.

1. Washing rice before cooking is a means of removing excess starch and the accumulated dust particles.

2. Boiling rice in excess water is not recommended due to the loss of nutrients in the drained liquid.

3. Place the rice in twice as much salted water, cover, bring to

a boil over high heat, and continue cooking about 15–20 minutes over very low heat.

4. Again, rice may be cooked in fat containing fried onions. At the end of 5–10 minutes the required amount of water is added. In the last two methods there is no chance of draining excess liquid. Any variation in the finished product calls for the same basic procedure of cooking. Browning of rice in fat dextrinizes the starch producing a distinct flavor. Swelling of the grain is decreased, yet each grain is very pronounced.

Other Cereals.

The cereal grains most commonly used in human diet are rice, wheat, corn, oats, rye and barley, listed in decreasing amount of total world consumption. For cooking the other cereals, besides rice, certain procedures are adopted. Mitchell and Bernard give three reasons for cooking cereals:

1. To improve the flavor
2. To improve digestibility
3. To soften the cellulose, thus improving the texture. (9, p. 448).

Whether raw or partially cooked cereals are prepared, the changes brought about by moist heat are similar. In cold water cereals swell only slightly, but as heat is applied the swelling increases rapidly until the maximum size of the granules is reached. The principles of starch cookery govern the cooking of cereals:

1. Cereals increase in bulk on cooking, since the starch granules absorb water and become greatly enlarged.

2. Quick and short cooking of cereals retains most of the B-Complex vitamins, but it is sometimes desirable to cook it for a longer time because of the flavor which develops. (7).

3. The type of cereal used and consistency desired in the finished product influence the amount of cooking water and length of cooking period.

4. Whole grains require a longer cooking time than do partially cooked or ground products.

5. Minimizing stirring during the softening process helps in maintenance of the original form of the cereal.

6. Slow addition of dry cereal to rapidly boiling water prevents lumping. The maximum absorption of water by the cereal starch occurs several degrees below the boiling point of water.

7. At the end of two minutes of rapid boiling the product is covered and steamed at a slow rate of cooking.

8. An even distribution of heat through a heavy metallic utensil gives a better grained product.

9. Salt inhibits to a slight degree, the absorption of water by starch granules, but it gives flavor and maintains the original shape of the grain.

Importance in the preparation of cereals is the combining of the cereal with water and the application of heat for the end result to be a uniform gelatinous mass. The surface particles exposed to the moisture tend to form a protective jacket around the dry and unchanged particles in the center of such a lump. Justin et al. give three methods for obtaining an even distribution of particles in the cooking of cereals and thus avoiding lumping.

Method I. Have salted water boiling rapidly. Slowly add the cereal, stirring the whole or flaked cereals only as much as is necessary, using a fork. This aids in preserving the shape. Cook over direct heat until the cereal has absorbed the water and becomes quite thick.

Method II. Stir the cold water into the cereal. Heat very gradually to the boiling point without stirring. Continue cooking the required time.

Method III. Stir the cereal into the water somewhat below the boiling point. Continue stirring until the boiling point is reached. Continue cooking the required time, stirring occasionally as needed. (7, p. 124).

The uncooked cereals, whether combined with water by methods I, II, or III, require long, slow cooking. This is supported by Justin and others (7). Variety is obtained in cereal preparation by substituting water for the following:

1. Milk or fruit juices constitute the liquid component of the product.

2. Addition of dried fruits, raisins and figs, for example, to the cereal early in the cooking period.

3. Addition of canned or cooked fruits, as for instance peaches and apricots, just before removing the cereal from the heat.

4. Combining the cooked cereal with fresh fruits, like bananas and berries, before serving.

Fats and Oils

Successful cooking with fats and oils requires a knowledge of certain characteristics of the food substances. These characteristics affect the choice of a particular fat or oil for a specific use. On heating fats and oils to high temperatures decomposition occurs and finally a point is reached at which acrolein is given off. This is the smoking point. The disagreeable odor of the fumes has given preference to the use of fats with high smoking temperatures for frying. Deep-fat-frying

is a popular method of cooking a wide variety of Pakistani foods. Consideration is given to the selection of a suitable fat, control of the amount of fat absorbed in cooking, and care of the used fat. Selection is made on the basis of flavor, smoking-temperature and shortening power. A fat that increases tenderness of a product or that covers the greatest surface area of a product may be said to have the greatest shortening power.

Cooked in a large amount of fat the fat absorption of foods is often less than when cooked in a small quantity. Also, the greater ease in measuring and controlling the cooking temperature in deep-fat-frying facilitates the production of a standard product. Dehydration of fruits and vegetables by deep-fat-frying is a comparatively new method. Sathiraswasti and Salunkhe (38) used a 350°F immersion temperature for peas of different size groups. A temperature below 350°F influenced the popping action and one above 350°F burned the peas. Previous work of deep-fat processing of carrots, beets, parsnips, peas, and lima beans suggested temperatures of 300°F and 270°-300°F. The popping action of peas is controlled by three main factors:

1. the immersion temperature; a temperature less than 350°F aids in breaking up the seed coat of peas;
2. the dipping technique;
3. the uniform ratio of peas and oil (coconut oil).

Stevenson and Miller list the functional roles of fats and oils in food preparation as follows:

1. Increase the palatability of other foods . . .
2. Tenderize baked products by shortening the gluten strands. . .
3. Lubricating foods and utensils. . .
4. Dispersing undesirable foaming, as in jelly making or cooking of legumes and vegetables. . .

5. Transferring heat. . .
6. Emulsifying with other liquids. . .
7. Preserving foods by excluding air. . . (12, p. 263).

The last function is limited due to hydrolytic and oxidative rancidity.

Vitamins and Minerals

Vegetables

The main objective in vegetable cookery is the preservation of vitamins, minerals, color, flavor and texture. The common methods of cooking are divided by Gordon et al. (48) into those which use steam and those which use boiling water. Baking does not fit into either of the two methods, but it is used for some vegetables. In an experiment for steaming a small amount of water was used in a tightly covered pan; the vegetable acids were not diluted nor did they have an opportunity to escape from the utensil. In boiling, the higher temperatures shortened the cooking time; there was a possibility of dilution of acids and their escape. Gordon et al. (48) have thus summarized that steaming methods might be expected to result in greater retention of vitamin C than cooking in boiling water. However, this is not always the case; slow cooking for example, results in a decreased retention of vitamin C.

Gordon and Noble (27) used the paired comparison method to determine which method of cooking developed strong flavors in vegetables of the cabbage family. The cooking methods were those described by Halliday and Noble (6) for cooking in boiling water, in a pressure saucepan, in a steamer, and in a tightly covered saucepan using the minimum amount of water to prevent scorching. Without the help of statistical treatment of the data it was apparent that the vegetables were milder in

flavor when cooked in boiling water than when cooked by steaming methods. In the steaming methods too, vegetables cooked in the pressure saucepan were judged milder than those cooked in the steamer and tightly covered saucepan.

Soils containing pathogenic organisms pollute plant materials coming in contact, thus increasing the probability for contamination from spoiled fruits and vegetables. Furthermore, due to lack of hygienic marketing conditions, a Pakistani consumer buys many of these products after they have been exposed to dust and insects and have been handled by numbers of people. There is a need for specific and inclusive study of the rules for preparing and cooking vegetables:

1. Vegetables need to be thoroughly washed, even slightly spoiled portions removed, and the roots and tubers scrubbed to remove dirt particles.

2. Soak the cleaned vegetables in fresh, cold water for a few minutes. This improves crispness and flavor, particularly recommended for using in the raw stage. A long period of soaking, however, dissolves much of the minerals and vitamins.

3. Thick-skinned vegetables require paring before cooking. Peeling after cooking results in less loss of nutrients, as paring before cooking eliminates a large portion of the cortex which is rich in minerals and starch.

4. Cutting vegetables into large portions reduces the exposed area thus minimizing the dissolving action of vitamins and minerals. Use as little water as possible to cook vegetables. Spinach and other tender greens need no water.

5. Bring water to a boiling point and add salt before the vegetables

are added. There is a reduced chance of the nutrients dissolving into the liquid when this is done.

6. Cover tightly and cook over low heat only until the vegetables are tender. There will be a very small amount of evaporation if the utensil is tightly covered and if cooking is done over low heat.

7. The question of draining the liquid does not arise in Pakistani dishes. No component of the vegetable dish is removed and discarded from the main product.

8. Cook strong-flavored vegetables uncovered so that the volatile acids and flavors escape with the steam. The latter part of cooking may then be done with the utensil covered.

9. Use of soda involves loss of natural flavor and texture. Too, the alkali hastens the destruction of the vitamins of the B-complex group and ascorbic acid. In institutions, vegetables are apt to stand for a time before being eaten, and if left over and warmed up the soda tends to increase vitamin losses and still further affect flavor and texture.

10. A small amount of vinegar or acid preserves the color of red cabbage and brightens beets. The acid also protects the ascorbic acid and prevents browning of cut or torn edges. The two goals in cooking vegetables are therefore:

1. Preservation of as much original nutritive value as possible in the vegetables.

2. Improvement of texture, color and flavor of cooked vegetables.

Fruits.

All fresh fruits should be washed in order to remove any traces of spray and dust which may be present. Fruits that are ripe enough to

eat should be placed in the refrigerator to prevent softening but should not be served too cold. Over-ripe fruits should never be served. To protect sliced portions of fruit from discoloration, citrous fruit juices are used. The discoloration is due to the action of oxidizing enzymes on Tannins and other compounds.

Fruit is cooked to obtain certain desirable properties. Justin et al. enumerate these factors as follows:

> to obtain variety
> to develop its palatability
> to increase its keeping quality
> to soften cellulose, or
> to cook the starch. (7, p. 93)

The method of cooking fruit is determined by the type of product desired, and the available variety.

If a sauce is desired the fruit is stewed. Cooking in water produces a softer mass than cooking in syrup. Sugar toughens the skin, as the uneven concentrations of sugar and fruit juice cause osmosis to take place.

For fruit to remain whole, baking or cooking in a syrup without stirring, are recommended. When fruit is baked, a covered utensil may or may not be used. If covered the fruit retains its shape better but does not brown. Browning may be achieved by removing the cover for a few minutes.

A short cooking time in a small amount of water in a deep, well-covered utensil, and with the minimum of sugar, favors the maximum retention of both natural flavor and nutritive value.

To avoid loss of any dissolved nutrients the juice or liquid in which the fruit is cooked needs to be served, as its palatability ensures acceptance by all and it contains water soluble vitamins and minerals.

Standardization of Recipes

Purposes and Value of Standardization

In analyzing and evaluating Pakistani recipes for use in hostel feeding a need was felt for standardizing quantity receipes. Graham defines a standard recipe in the following words: "A standard recipe is a recipe which establishes procedures that will make possible the production of high quality food." (28, p. 582). There are differences in the recipes of today and the past and certain factors are responsible for this difference. Food standards have changed, equipment and ingredients are no longer the same and more emphasis is placed on the preservation of nutritive value of foods than was done in the past. This change was brought about to improve the quality, simplify the method and lower the cost of food.

The purpose and value of standardized recipes is seen in the following enumeration by Smith:

1. They save time for both cook and manager, allowing more time and money for skill and finesse in preparing, serving and merchandising of food.
2. They eliminate guesswork and waste due to poor estimating of quantities and failures in cooking.
3. They eliminate variations in quality and quantity of product, making frequent sampling and "doctoring" unnecessary.
4. They simplify the job of training a new worker.
5. They assist in food cost control by providing a means of:

a. Figuring accurate cost of the material used.
b. Estimating yield to be expected.
c. Checking losses and making necessary adjustments by use of fewer or cheaper materials.
d. Maintaining quality.
e. Preventing leftovers. (11, p. 114).

The two major components of a recipe are the list of ingredients and the method of preparing the product. Products may be of a certain color, flavor, texture and consistency which affect the acceptability factor. Today, scientific procedures are applied to the preparation of

a quality product. Nutritive value of menus is determined by acquiring information about the types and amounts of ingredients used. Too, the cost factor is controlled by making economical changes in recipes that have been carefully studied.

Directions for preparing and cooking the product are given in a precise, clear and accurate form. Measuring instruments for ingredients need to be in an adaptable and practical form to save time and simplify work. A recipe card includes all pertinent information which is more or less of a permanent nature. For example:

1. the weights or measures used
2. ingredients in the order used
3. cooking directions that are concise and exact in detail
4. directions for serving
5. cost of recipe
6. number of servings.

Setting up a Tasting Panel

In planning the standardization of recipes certain decisions need to be made. The first decision is the selection of a cooking method. This is based on a basic information about the foods. Secondly, the products are evaluated by a tasting panel and the number of replications used in an experiment depend, ". . . on the variability of the samples, the variability of the judges results, the magnitude of the difference between samples and the completeness of information desired in one experiment." (18, p. 232).

Selected judges are used to measure the differences in aroma, flavor, texture and other qualities of experimental samples. For a reliable estimation of minute details, a small, trained, selected panel is used.

Physical and chemical tests supplement the selected panel tests.

Methods of expressing and analyzing differences in samples are the paired and triangle difference tests, dilution test, scoring tests, and ranking tests. For the purpose of this study the scoring test or numerical rating is used throughout the standardization of recipes. Many factors are judged in the scoring tests, and appear on the record in logical order. The factors estimated by sight come first, then aroma and finally those which can be scored only when the food is taken into the mouth.

The range of scores used differs with different investigators. Scales of frequent use range from 1 to 5, or 10. A large number of intervals increases the variability of scores and also the experimental error. "An individual who consistently uses less than the total scoring range will appear to score samples more consistently than individuals who use the total range available." (18, p. 237)

One of the limitations of sensory testing is the variability of response of individuals to a given stimulus and of an individual's response at different times. These variations may be decreased by training and selecting judges, checking their performance on tests and maintaining their interest in the work. The environment, for example, plays a major part in providing aspects conducive to concentration. Distractions and interruptions need to be minimized, and the judges need to refrain from inter-communication.

Giradot et al. (26) describe the procedure which has been evolved to select efficient panels. It involves two stages: first, testing of ability to make simple discrimination of differences between samples; second, testing of ability to reproduce qualitative judgements. Candidates

are eliminated in the first stage primarily because of lack of sensitivity to the flavors involved, and to some extent due to poor flavor memory, slow stimulation, and failure to understand the test.

Motivation is an important factor in evaluating a person's value as a panel member. The size of the group initially tested affects the efficiency of the ultimate panel, since the larger the number the greater the probability of finding persons of superior ability.

CHAPTER III

METHOD OF PROCEDURE

Menu Planning

One of the basic responsibilities of a food service manager is the planning and preparing of wholesome and nutritious food. The first step in planning one week's menu was to ascertain the daily food needs of the college girl in the Karachi College of Home Economics. If the average age of the group falls between the range of 18 to 20 years, the daily caloric requirement would be 2,400 per individual. See Table I.

The Recommended Dietary Allowances (52) were designed to maintain good nutrition in healthy persons in the United States and are the basis in planning and evaluating the diets of college girls. These allowances do not represent minimal requirements, but are levels (50 per cent above minimal requirements) high enough to cover practically all individual variations among normal people.

Foods available in Karachi during the months of September and October were listed, from which selection was made for one week's menu. From the list of meats, vegetables, bread, milk and fruits, the item that is likely to be in shortage in the Pakistani diet is the meat. Consideration was given to this factor and emphasis was placed on the daily inclusion of protein-rich lentils. Other inexpensive sources of protein in the Pakistani diet are fish, ground-nuts and whole grains.

TABLE I

RECOMMENDED DAILY DIETARY ALLOWANCES[1]

Person	Age Years	Weight Pounds	Height Inches	Food Energy Calo-ies	Pro-tein gm.	Cal-cium gm.	Iron mg.	Vita-min A I.u.	Thia-mine mg.	Ribo-flavin mg.	Niacin Equiva-lent mg.	Ascor bic Acid mg.	Vita-min D I.u.
Girls	16-19	120	64	2400	75	1.3	15	5000	1.2	1.9	16	80	400

[1]"Recommended Dietary Allowances." National Academy of Sciences, National Research Council, 1958. Washington, D. C. 1958, p. 18.

The ratio of the three energy-giving foodstuffs in the diet is influenced to a great degree by factors like availability and cost, habits, customs, cultures and taste. The comparatively high cost of protein is the main reason why this foodstuff furnishes so small a part of the day's calories. Also, the use of animal protein is restricted due to the shortage of beef and mutton.

In planning the three meals of the day and the tea snacks, conscious effort was made to include foods acceptable to the group of Pakistani college women. See Appendix B (pp. 80-88). An effort was also made to introduce foods of a foreign origin. The ease of preparation in large quantities was another factor of importance. The Pakistani diet contains much fat, contributing palatability and satiety to the meal. The vegetable fats are used widely in pan-frying and deep-fat-frying. The animal fats are replaced by vegetable oils, for example, mustard oil, and "ghee" is the butterfat. Vegetables are cooked in fats and oils to improve flavor and color.

From data concerning the major food commodities available in Pakistan, selection was made for the one week's menu. The types and servings of food were tabulated for the adult group of Pakistani women. Since the age of a majority of the young women ranged between 16 to 19 years the number of servings were increased with respect to milk and bread. The tabulated information was compared with the standard "A Daily Food Guide." See Appendix C (pp. 90-96). The main part of the diet was selected from four broad food groups and from each group the standard number of servings were designated. They are as follows:

Groups	Standard Servings per Day
Meat	2 servings of 2-3 ounces
Vegetable and fruit	4 servings of one-half cup each
Bread and Cereal	4 servings of one slice bread or one-half cup cereal each
Milk	2 cups or 16 ounces

Alternatives were also taken into account. For example, in place of two to three ounces of lean cooked meat, poultry or fish, the equivalent of two eggs, one cup cooked dry beans, dry peas, or lentils was selected.

The fairly accurate estimation was further evaluated by calculating from food composition tables, the nutrients in the meals set up for a seven day period. See Appendix C (pp. 97-103).

Calculations of the nutrients in the week's menu, indicated some deficit of niacin and calcium six days a week, iron and thiamine two days per week and calories and ascorbic acid only one day per week.

Consideration was given to the above deficits in planning the tea which is the equivalent of snacks in the United States. The afternoon tea is served regularly, seven days of the week. Variety in the tea snacks was maintained by selecting from the following foods:

1. Three kinds of fruits, citrous and others.
2. One or two sweet dishes.
3. One or two non-sweet foods.

Each day's tea snack was composed of a beverage which was either milk, fruit squash or tea, a biscuit or cookie and a piece of fresh fruit. The day's nutrients in a serving of the tea foods for the seven-day period were added to the average nutrients of the three meals of a day. This procedure was followed to determine whether adequate daily nutrients are received as compared with the Recommended Dietary Allowances. See Appendix C (pp. 97-103).

Standardization of Recipes

The food preparation procedures in Pakistan are traditional to a large extent. Common practices are adopted readily, though now a change is taking place. Food preparation procedures are either explained,

sustained or revised. There is, therefore, a need for standardizing good preparation procedures and being consistent in their use, unless certain factors call for a change. The methods of procedure, usually expressed as recipes, give the proportions of ingredients to be used and the method of combining and cooking the ingredients. A good recipe may include the approximate time of preparation, yield and cost -- facts which are of vital importance in the field of catering.

Selection of recipes for institutional food preparation required an evaluation of the products for flavor, texture, color, consistency and acceptability. For the production of high quality foods, flavor is always the primary consideration. Increase or decrease in the proportion of ingredients, temperature of cooking and spices used, above or below the optimum, may cause undesirable changes in the product.

The limitations of time and other resources led to the inclusion in this study of four recipes to be standardized that are basic to the everyday meals served in Pakistan. The four recipes were chosen to represent the Four Basic Food Groups; namely, milk, meat, vegetable and cereal.

Food Groups	Recipes
Meat	Kurma
Vegetable	Vegetable curry
Cereal	Puri
Milk	Firni

Devised for 25 people, the standard servings used in this study were as follows:

Foods	Servings
Meat	3-4 ozs.
Vegetables	2/3 cup
Bread	2-3 slices
Milk, dessert	1/2 cup

The taste panel that evaluated the products ranged from 15 to 18

in number, and was comprised of Pakistani college students studying at Oklahoma State University. Due to varying class schedules only nine members reported on all testing days. The evaluations of these nine members were tabulated for the final results.

Letters describing the study were sent to the students and a request was made to check and indicate their willingness to participate in the study. Appendix A. (p. 77). The majority of the panel was expected to rate the acceptability of the products on a comparative basis with their home experiences. The eleven women were graduate students in the College of Home Economics, while the remaining panel members consisted of men students in areas other than Home Economics. The women were either home makers or were exposed to home cooking. This characteristic was likely to differentiate their ratings from the ratings of those panel members who had no previous experience. Again, because the panel was not one of trained experts, it was necessary to use the comments and suggestions of the panel members as guides rather than as the last word.

The panel used a numerical score sheet to judge the degrees of color, texture, consistency, flavor and acceptability as: excellent, very good, below good - above fair, fair, below fair - above poor, poor, very poor, and extremely poor. The numerical rating scale ranged from one to nine. The score sheet provided space for the panel's comments and suggestions for improvement. See Appendix A . (p. 78).

The recipes were tested in three stages:

Experimental recipe
revised recipe
standardized recipe.

At each stage changes were made to improve the product and raise the

point of acceptability. The lowest limit of maximum standardization of a recipe was 89 per cent a score of "very good" while the upper limit was a 100 per cent an "excellent."

In conjunction with the experimental work of a Filipino graduate student, schedules were arranged for eight experimental days. The same panel evaluated two or more products comprised of Pakistani and Filipino recipes. An effort was made to provide a balanced noon meal for the panel who rated the products some time between eleven in the morning and twelve-thirty in the afternoon. The experiments were conducted on successive Tuesdays and Thursdays of the week.

The experimental recipes were selected:

1. To include foods from the Four Basic Food Groups: namely, meat, vegetables, milk and bread

2. To form a general method for assessing the ratio of the amounts of spices to meats and vegetables

3. To formulate an average time of cooking the different foods

4. To include fresh produce and hence make the conditions similar to the ones existing in Pakistan

5. To provide an adequate area for the application of the principles of cooking foods commonly used

6. To determine the number of servings of a standard size obtained from a certain amount of ingredients

At the beginning stage the experimental recipes were tested one at a time in order to determine the time of cooking at distinctive steps of the procedure. For example, time required to fry sliced onions and spices, brown the meat and tenderize the vegetables was recorded. The approximate estimation was further narrowed down to definite expenditures

of time.

A conscious attempt was made to simplify the procedures, preserve the nutrients and apply the correct method of cooking meat, vegetables, cereal and milk. The use of one kettle preserved the nutrients to a large extent and also decreased the expenditure of time and energy. The size of the kettle as indicated in the recipe, if changed, may vary the time of cooking the product.

Surface cookery was adopted throughout the experimental period since this is a common form of cooking in Pakistan. The gas oven was used instead of an electric one to make an authentic setting as it may exist in the Karachi College of Home Economics.

CHAPTER IV

RESULTS AND DISCUSSION

Adequacy of Menus

When the week of menus were evaluated by comparison with the number of servings recommended in the Basic Four Food Groups for adults, they were found to be inadequate for the young women 16 - 19 years of age. The number of servings were increased from 2 cups of milk and 3 slices of bread to 3 cups of milk and 4 slices of bread per day. The daily servings of each of the four food groups are presented in Table II. These figures do not include the servings from the tea snacks. Most foods contain more than one nutrient and no single food contains all the nutrients in the amounts needed. Therefore, the Basic Four Food Group plan guides in the wise selection of foods needed to supply certain nutrients. It is an instrument for everyday use in planning menus and appraising the nutritive value of a diet. More accurate results, however, were obtained by calculating the nutritive value of the menus. It was a time-consuming approach and some error was present due to variability in foods and their values in the tables used. The latter method is applicable for occasional evaluation of the nutritive value of menus.

Calculations of the nutritive value revealed a shortage of the following nutrients listed in descending order of deficiency.

TABLE II

DAILY SERVINGS OF BASIC FOUR FOOD GROUPS IN WEEK'S MENUS

	Milk Group	Meat Group	Fruit, Vegetable Group			Bread, Cereal Group
			Green Yellow	High Vitamin C	Others	
Monday	3	2¼	1½	1½	1½	6
Tuesday	2-3/4	2½	2½	½	½	5
Wednesday	3	2-3/4	2¼	1½	¼	4
Thursday	3-1/8	3¼	1	1½	1½	6
Friday	3	3	1-3/4	1	2	5
Saturday	3-5/8	2-3/4	2	1	1	5½
Sunday	3-1/8	3	1¼	2	3/4	5
Recommended Servings Per Day	2 or more cups	2 or more servings	4 or more servings			4 or more servings

Nutrients	Days per Week
1. Calcium	6
2. Niacin	6
3. Iron	2
4. Thiamine	2
5. Ascorbic Acid	1
6. Food Energy	1

The result was obtained by comparing the nutritive value of menus with the Recommended Dietary Allowances. The values, however, were above the Minimum Daily Requirement. Foods rich in the nutrients that were found deficient in the week's menus were included in the tea snacks. Table III presents the total calculated nutritive value of each day's food intake, including the tea snacks. Comparison with the Recommended Dietary Allowances indicated that the nutritive values were either equal to or above the recommended intakes for young women when the tea snacks were added to the three meals of the day.

Standardized Recipes

The four experimental recipes were evaluated by a tasting panel for the following characteristics: color, texture, consistency, flavor and acceptability. Appendix D (p.106-109). The numerical scale of the score card was 45 for a perfect product. The scores of 9 panel members for each of the three evaluations for three dishes are in Appendix E, Tables A through I (pp. 114-122).

Some disparity existed in the panel members which may be due to their family and cultural differences. Respondents from East and West Pakistan have been exposed to different forms of cooked food. The same product is made of different ingredients and also cooked in a different manner in the two sections of the country. The regional difference

TABLE III

CALCULATED NUTRIENTS IN ONE WEEK'S MENUS

	F.E. Cal	Protein Gm.	Fa Gm	Car Gm	Calcium Mg	Iron Mg	Vitamin A I.U.	Thi Mg	Rib Mg	Nia Mg	As Acid Mg
Monday	2495	89.2	152.9	203.1	1099	14.6	11,867	1.20	2.19	15.2	135
Tea Snack	626	20.0	50.0	49.0	315	2.2	443	0.21	0.56	2.3	10
Total	3121	109.2	202.9	252.1	1414	16.8	12,310	1.41	2.75	17.5	145
Tuesday	2179	80.0	149.6	160.4	1063	14.4	19,025	1.13	2.24	14.9	88
Tea Snack	664	22.0	31.0	74.0	374	4.4	618	0.43	0.65	1.5	8
Total	2843	102.0	180.6	234.4	1437	18.8	19,643	1.56	2.89	16.4	96
Wednesday	2564	99	145.7	216	1100.5	15.7	6,817	1.31	2.19	15.9	130
Tea Snack	288	11	11.0	41	316.0	0.9	1,353	0.15	0.48	1.1	6
Total	2852	110	156.7	257	1416.5	16.6	8,170	1.46	2.67	17.1	136
Thursday	2747	108	154.0	235	1207	16.3	5,756	1.23	2.44	15.2	68
Tea Snack	275	4	6.4	50	118	1.1	90	0.16	0.15	1.1	76
Total	3022	112	160.4	285	1325	17.4	5,846	1.39	2.59	16.3	144
Friday	2654	99	145	242	1151	15.8	19,037	1.13	1.99	12.8	105
Tea Snack	792	24	38	75	334	5.1	1,995	0.46	0.79	3.2	11
Total	3446	123	183	317	1485	20.9	21,032	1.59	2.69	16.0	116
Saturday	2863	115	156	254	1483	16.8	14,426	1.30	2.66	15.8	141
Tea Snack	245	3	3	45	69	0.5	250	0.05	0.06	0.4	10
Total	3108	118	159	299	1552	17.3	14,676	1.35	2.72	16.2	151
Sunday	2424	102	133	204	1112	16.7	18,983	1.23	3.15	19.9	290
Tea Snack	336	3	16	37	326	0.6	2,025	0.17	0.50	0.9	53
Total	2760	105	149	241	1438	17.3	21,008	1.40	3.65	20.8	343
R. D. A.[1]	2400	75			1300	15.0	5,000	1.20	1.90	16.0	80
M. D. R.[2]					750	10.0	4,000	1.00	1.20	10.0	30

[1]Recommended Dietary Allowances for 16-19 year old girls.

[2]Minimum Daily Requirements.

accounts, to some extent, for the results obtained.

The percentage ratings of nine panel members for all three evaluations of three dishes are presented in Table IV. In the experimental recipes of Kurma, color, flavor and acceptability were scored considerably higher than consistency and texture. Observations made from the panel ratings and comments were as follows:

1. The meat was not desirably tender
2. A tablespoon of salt was not sufficient
3. A pound of yoghart produced a sharp, sour taste
4. The amount of fat used was more than desired
5. There was a conspicuous lack of chili powder
6. Exclude tumeric completely
7. Inclusion of curry powder would enhance the flavor

The revised recipe of Kurma was scored with favorable comments, the ratings increasing for each quality scored. The largest increases were in the scores for consistency, acceptability and flavor. The revised recipe was changed in the following ways:

1. A decrease of a fourth of a pound each of yoghart and fat improved the consistency
2. The change in the proportion of spices was adequate
3. The meat was still not tender, therefore, the cookery time was increased by a half-hour period

In the third evaluation two and one-half hours of cooking increased the acceptability from the first rating of 80 to the third one of 90.2 per cent. See Table IV. The meat was tender and spicy. The recipe was accepted after three evaluations. The standardized recipe for Kurma

TABLE IV

AVERAGE PERCENTAGE RATINGS OF THE THREE PANEL EVALUATIONS

Product	Evaluations	Color	Texture	Consistency	Flavor	Acceptability
Kurma	1	81.1	77.7	72.2	80.0	80.0
	2	83.3	83.3	86.6	88.8	90.0
	3	88.8	91.1	88.8	92.2	92.2
Vegetable Curry	1	65.5	68.8	71.1	71.1	73.3
	2	88.8	85.5	81.1	78.8	83.3
	3	92.2	91.1	91.1	91.1	93.3
Firni	1	88.8	81.1	86.6	88.8	84.4
	2	91.1	82.8	80.6	91.7	88.8
	3	91.1	90.0	90.0	93.3	94.4

is on page 60.

The experimental recipe of vegetable curry was rated low in regard to color and texture. From the comments and panel ratings the following observations were made:

1. Due to incomplete frying the spices had a raw taste
2. The proportion of the fresh vegetables was not balanced. Cauliflower was one pound in excess, while tomatoes were one pound in deficit
3. An increase in the quantity of onions to double the former weight was desirable
4. Salt and corn oil were increased from one tablespoon and one cup to one and one-half tablespoons and one and one-half cup respectively
5. Inclusion of the spices, curry powder and tumeric, would produce a desirable flavor.

The revised recipe was improved in all five qualities, particularly in color, Table IV. Helpful comments of panel members included:

1. The curry had more than the optimum quantity of tumeric which needed to be cut down from one to one-half teaspoon
2. There was a need to increase salt to two tablespoons and decrease curry powder to two teaspoons
3. An effective control in cooking time of three types of fresh vegetables and a frozen one would help retain texture and shape

The third evaluation of vegetable curry was satisfactory to most of the panel members who gave favorable comments about the flavor. The average percentage ratings of the tasting panel are presented in Table IV. The acceptability of curry increased from 73.3 to 93.3 per cent in

Standardized Recipe

Kurma

Amount	Ingredient	Method
1 lb. 3/4 lb.	Onions Vegetable fat	In a 6-quart kettle saute sliced onions for 20 minutes or till light brown.
	Add	
1 tsp. 1 Tbsp. 1 Tbsp. 1 tsp. 1 Tbsp.-1 tsp.	Ginger Paprika Curry Powder Chili Powder Salt	Make a paste of the spices in 1/4 cup of hot water. Add this to the onions and fry for 10 minutes.
	To the above Mixture, add	
6 lb. 4 cloves	Beef-cubes Garlic, chopped	On low heat, brown the meat for 35 minutes.
	Add	
3/4 lb.	Yoghart	Cook the mixture for 35 minutes or until the fat separates from the sides of the kettle.
	Add	
3 cups	Hot water	Cover and simmer the mixture for 50 minutes or until the meat becomes tender.

Approximate Time: 2½ hours

Yield: Approximately 3 quarts (25-½ cup servings)

the first and last evaluations. Controlled cooking of the vegetables preserved the texture of cauliflower, potatoes and peas. The standardized recipe for vegetable curry is presented on the following page.

The experimental recipe of firni was scored low on the texture of the product. See Table IV. The flavor of rice was noticeable and the panel suggested the addition of rose-water or a similar flavoring substance. These observations were made:

1. Rice was not ground to the desired fine texture
2. Addition of a flavoring substance, such as rose-water or cardamon powder, would enhance the flavor of firni
3. There was need for a thorough blending of milk and rice

The revised recipe has two major changes, namely, inclusion of yellow food coloring and cardamon powder. The second panel rating dropped six points in relation to the consistency of the product. This was due to the formation of lumps of rice. The panel observations may be summed up as:

1. There was a decrease in acceptability due to the formation of rice lumps. Continuous agitation would eliminate this problem
2. The addition of yellow food color and cardamon powder was accepted by the panel with favorable comments.

One factor that raised the panel rating of the standardized recipe was the uniform blending of rice and milk. An electric blender ground the rice to a fine powder. The panel ratings of consistency, texture and acceptability increased in the order given in Table IV. Changes pertinent to the development of the final product were:

1. Milk was increased from three to four quarts to balance the ratio of milk to rice.

Standardized Recipe

Vegetable Curry

Amount	Ingredient	Method
1 lb. 1¼ cup	Onions Mazola or Corn Oil	In a 6-quart kettle fry sliced onions in 1¼ cups of corn oil, for 10 minutes.
	Add the Spices	
1 tbsp. 1 tbsp. 2 tsp. 2 tsp. 1 tsp. 2 tbsp.	Ginger Paprika Chili Powder Curry Powder Tumeric salt	Make a paste of the spices in ¼ cup hot water. Add the paste to the onions and fry for 20 minutes. Stir continuously.
	Brown for 10 Minutes	
2 lbs.	Potatoes, white and fresh	Wash, peel and cut potatoes, into one-half to one inch cubes.
	Add	
2 lbs. 1 cup	Cauliflower, fresh water, hot	Cut in one inch cubes and wash the cauliflower. Add this to the above mixture, pour in hot water, cover and simmer for 10 minutes.
	Spread on Surface	
2 lbs. 10 oz. 1 medium	Tomatoes, sliced Green peas, frozen Green pepper	Wash the tomatoes and green pepper. Slice the tomatoes and cut the pepper into strips. Cook the mixture on low heat for 10 minutes or until the peas are tender.

Approximate Time: 1 hour

Yield: Approximately 4 quarts (25- 2/3 cup servings)

2. An electric blender was effective in grinding the rice to a very fine grain.

In the first to the third evaluation the acceptability ratings increased from 84.4 to 94.4 per cent. The standardized recipe is presented on the next page.

The experimental recipe of puri included a teaspoon of salt which was rated insufficient. Appendix D (p.109). The panel ratings were particularly high for the first evaluation of the product. Appendix E, Table J (p.123). The oils used for deep-fat-frying vary in different sections of Pakistan. The author's observations included the following factors regarding oil in puri.

1. The fat absorption was 75 per cent. On an average one puri absorbed one per cent of the total volume of corn oil used
2. The size of the serving was satisfactory to the panel
3. The first evaluation produced an acceptability rating of 89 per cent, or 'very good.' Because of this high score the experimental recipe was accepted as the standardized one.

The standardized recipe of puri is presented on page 65.

The concept "panel" was used in this study in the specific sense which limits it to groups with special qualifications. The qualifications were that the panel was composed of Pakistani men and women, mature enough to have developed a taste for Pakistani food. The students in this study had such a variety of schedules that pretesting of panel members was not feasible. Factors which required the evaluation of panel members were measurement of effect of color, estimation of the intensity of component flavors, analysis of texture and consistency and an evaluation of acceptability.

Standardized Recipe

Firni

Amount	Ingredient	Method
4 qts.	Milk, whole	In a heavy-bottom, 6-quart kettle boil milk for 30 minutes.
	Add	
1 cup	Rice	Grind the raw rice to a very fine texture in an electric blender.* Cook the mixture for 30 minutes, stirring continuously.
	Add	
3 cups 1 tbsp.	Sugar, granulated Cardamon Powder	Continue to cook the mixture for 30 minutes. Stir occasionally to prevent scorching. Before removing from heat, blend cardamon powder into the mixture.
	Top With	
½ cup	Blanched almonds, sliced	Chill and serve.

Approximate Time: 1½ hours of preparation

Yield: Approximately 3 quarts (25-½ cup servings)

*A mortar and pestle or a buffalo chopper may be substituted for the blender.

Standardized Recipe

Puri

Amount	Ingredient	Method
2½ lbs. ½ lb. 2 tsp.	All-purpose Flour Whole-wheat Flour Salt	Mix together the dry ingredients (not sifted).
	Cut-in	
4 tbsp.	Vegetable fat	
	Add, at intervals	
3 2/3 cups	Water	Knead the dough, cover with a towel and set aside for one hour. Roll the dough 1/10 inch thick and cut into circular pieces, 4 inches in diameter.
	Heat	
1 qt.	Mazola or Corn Oil	In a 6-quart pan deep-fat-fry the puris.

Approximate Time: 2 hours

Yield: 75 puris (25 - 3 puri servings)

During the process of evaluation one of the results of major interest was the panel rating of acceptability as a separate quality and acceptability scores based on the combined four characteristics: color, flavor, texture and consistency. Table V presents the acceptability ratings based on scores of nine panel members. In seven out of nine evaluations, acceptability as a separate quality was rated higher than an acceptability score based on the combined four characteristics. The range of difference, however, was low which indicates the inclusion of acceptability as a separate characteristic to be of little importance.

Recognition should be given to the limitations of the tests. However, the standardization of recipes introduced an area of future work as standardization is a continuous process. The procedure used in setting up a tasting panel and evaluating the acores of panel members affords an experience which can be utilized in Pakistan.

TABLE V

ACCEPTABILITY BASED ON SCORES OF NINE PANEL MEMBERS

Evaluation	Acceptability as a separate quality		Acceptability score based on color, flavor, texture, consistency	
	Average Score	Per cent	Average Score	Per cent
Kurma				
1	7.11	79.0	7.3	81.44
2	8.0	88.88	7.63	84.77
3	8.22	91.33	8.08	89.77
Vegetable Curry				
1	6.22	69.22	5.77	64.16
2	7.33	81.44	7.55	83.88
3	8.33	92.55	8.02	89.16
Firni				
1	7.33	81.44	7.27	80.9
2	7.66	85.11	7.64	84.86
3	8.44	93.77	8.27	91.94

CHAPTER V

SUMMARY AND CONCLUSIONS

Menu Planning

The nutritional evaluation of one week's menus for the Karachi College of Home Economics revealed the difficulty of obtaining thiamine, niacin and calcium in quantities advocated by the Recommended Dietary Allowances of the National Research Council for young women of college age.

When lentils were served daily along with increases in animal protein foods, milk and whole grain cereals the deficient nutrients were increased to meet the Recommended Dietary Allowances.

Fresh fruits and vegetables are available in liberal amounts to those who can afford to purchase them. Vitamin A and ascorbic acid were not difficult to provide in sufficient amounts in the menu for Karachi College of Home Economics.

Recommendations.--From the study of menu planning certain factors were evolved which may be of use in the area of quantity food preparation in Pakistan. These are as follows:

1. Select foods according to season and provide as wide a variety as possible
2. To plan nutritionally adequate menus in Pakistan there is a need to stress use of animal protein foods, legumes and whole grains. The Basic Four Food Groups serve as a guide

3. Because economic status of the groups served controls the food pattern to a large extent, the reduction of cost of preparation helps to meet their economic limitations
4. Equipment and physical facilities require consideration by the person who plans the menus
5. In a quantity food service, plan the preparation of food in relation to the number and ability of employees
6. Concentrate all parts of the organized whole for effective management
7. A perpetual interest in the field of research can lead to better results.

Standardization of Recipes.

In planning the standardization of Pakistani recipes the author experienced some difficulty in the selection of the tasting panel. From a total of 18 judges the ratings were analyzed for only those panel members who appeared on all the testing days. The ratings of nine panel members were included in this study.

The effect of flavor had a pronounced bearing on the acceptability of a product. The time of frying spices was a controllable factor which influenced flavor development.

Fresh vegetables are an important source of vitamins and minerals. To preserve the nutrients, the time of cooking the vegetables was rigidly controlled.

In order to improve the acceptability of firni various methods of breaking the rice grain were used. In the final evaluation, the investigator was successful in producing the desired texture and flavor of the product by using an electric blender.

Acceptability of the products when based on the four characteristics; color, texture, consistency and flavor, was found to be very similar to acceptability rated as a separate quality.

Recommendations.--In Pakistan, the need of standardized methods for cooking foods is very great. The following conclusions are made as recommendations for further work in the area of standardization.

1. The tasting panel should be made up of trained Pakistani judges. Ten, or more than ten, judges provide a satisfactory panel for appraisal
2. Include only those characteristics in a score card which have a worth while bearing on the evaluation of a product
3. Be economical of time, energy and material when standardizing recipes
4. The exact amount and kind of ingredients that go into a recipe need to be known
5. Follow good methods of cookery to preserve the nutrients in the cooked product
6. Record all information pertinent to the production of a standardized recipe to be used by others.

The value of standardized recipes is undeniably high for a food service operation. This is particularly true for a newly established facility where experience is at a minimum. The author has attempted to formulate a study which, it is hoped, will be continued in the Karachi College of Home Economics, Pakistan.

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APPENDICES

APPENDIX A

FNIA 500

Food, Nutrition, & Inst.
Adm. Department
Oklahoma State University
Stillwater, Oklahoma
February 10, 1961

Dear_____,

A study is being conducted on the Standardization of Pakistani and Filipino Quantity Recipes. This comprises an experimental part of two theses. Your evaluation as a tasting panel member will be greatly appreciated.

Approximately four Pakistani and three Filipino dishes will be tasted. Starting from Thursday, February 16, 1961, the panel will meet between 11:00 a.m. until 12:30 p.m. in Room 401, New Home Economics Building on the following days:

Thursday, February 16
Tuesday, February 21
Thursday, February 23
Tuesday, February 28

The pannel members are requested to help in the experiment by paying the raw food cost, approximately 45 cents, of a serving of the experimental dishes.

In case of necessary repetition the panel members are requested for further cooperation. Another letter will, therefore, furnish a definite schedule for the second analysis.

Please check the following to indicate whether you can participate in the project.

YES_____

NO _____

Your prompt reply by Saturday will be helpful. Please use the campus envelope and mail to Food, Nutrition and Institution Adm. Dept., Room 108, Old Home Economics Building.

Thanking you

Sincerely,

kulsum Suleman

Maria Lourdes G. Guzman

FNIA 500
(Project of Kulsum Suleman)

SCORE SHEET

PRODUCT_____

NAME _____ DATE _____

Before you is a sample of a dish popular in Pakistan. Please examine and score the sample with respect to the stated quality in question using the following scale:

Extremely poor	1
Very poor	2
Poor	3
Below fair-above poor.	4
Fair	5
Below good-above fair.	6
Good	7
Very good.	8
Excellent.	9

Qualities in question	SCORE	Comments
1. Color		
2. Texture		
3. Consistency		
4. Flavor		
5. Acceptability		

SUGGESTIONS FOR IMPROVEMENT:

APPENDIX B

One Week's Menus for Karachi College of Home Economics

I. Menu - Monday

Breakfast

Apricot - fresh	1 whole
Wheat Porridge	½ c
Cream - half and half	½ c
Toast - Wheat white	2 slices
Butter	2 pats
Milk - whole	1 c
Sugar - White cane	2 tsp.

Luncheon

Fruit Salad:	
Cantaloupe - fresh	1/8 c
Apple - fresh	¼ c
Peach - fresh	¼ c
Stuffed Pepper:	
Sweet Pepper	1 whole
Minced beef	3 oz.
Onion	1 tsp.
Vegetable fat	2 tsp.
Dal:	
Lentils	¼ c
Onion	1 tsp.
Butter	1 pat
Chappati - enriched	
Whole grain wheat	2 slices equivalent
Milk	1 c

Dinner

Steamed Rice	½ c
Kima:	
Lamb: Rib chop	2 oz.
Meethi, green leafy	¼ c
Onion	1 tsp.
Vegetable fat	1 tsp.
Beets:	
Beets	½ c
Vegetable fat	2 tsp.
Bhaji:	
Eggplant	¼ c
Tomato	¼ c
Onion	1 tsp.
Vegetable fat	2 tsp.
Gulab Jamoon:	
Cream, half and half	½ c
Sugar	2 tsp.
Butter	1 tsp. (2 pats)

II. Menu - Tuesday

Breakfast

Pear - fresh	1 whole
Scrambled eggs:	
Egg	1
Milk	2 tsp.
Toast, Wheat white	2 slices
Butter	2 pats
Milk - whole	1 c

Luncheon

Vegetable Palao:	
Rice	½ c
Carrots	¼ c
Peas	¼ c
Onion	1 tsp.
Vegetable fat	4 tsp.
Meat Ball Curry:	
Ground beef	3 oz.
Onion	1 tsp.
Buttermilk	1/8 c
Vegetable fat	1 Tbsp.
Tomato Chutney:	
Tomato ketchup, 2 Tbsp. (gms.) tomato, sugar, vineger, salt, onions and spices	
Milk - whole	1 c

Dinner

Brain Curry:	
Brain, lamb	3 oz.
Tomatoes	½ c
Onion	1 tsp.
Vegetable fat	1 Tbsp.
Palak-Ki-Bhagi	
Palak - green leafy	½ c (spinach value)
Onion	1 tsp.
Vegetable fat	2 tsp.
Paratha	2 slices equivalent + 2 Tbsp. fat
Ice cream	2/3 c

III. Menu - Wednesday

Breakfast

Grapefruit	½ medium
Bhaji:	
Potato	1 medium
Onion	1 tsp.
Vegetable fat	1 Tbsp.
Paratha:	
White wheat	1 slice equivalent
Vegetable fat	1 Tbsp.
Milk	1 c

Luncheon

Tomato soup	½ c (½ tomato and ½ broth)
Roast, beef	3 oz.
Bhagi:	
Turnip	½ c
Onion	1 tsp.
Vegetable fat	1 tsp.
Hot Rolls	2
Milk	1 c

Dinner

Rice, steamed	½ c
Dal:	
Lentils	¼ c
Onion	1 tsp.
Butter	1 pat
Kabab:	
Ground beef	3 oz.
Vegetable fat	1 Tbsp.
Onion	1 tsp.
Mixed Bhagi:	
Eggplant, diced	1/8 c
Potato, diced	¼ c
Green leafy	1/8 c (spinach equivalent)
Vegetable fat	2 tsp.
Custard	1 c (1 egg and 1 c milk)

IV. Menu-Thursday

Breakfast

Apple, fresh	1 medium
Omelette	
Egg	1
Onion	1 tsp.
Vegetable fat	2 tsp.
Doughnut	1
Toast, whole white	2 slices
Butter	1 pat
Milk, whole	1 c

Luncheon

Khubuli:	
Rice	½ c
Lentils	¼ c
Onion	1 tsp.
Vegetable fat	4 tsp.
Kurma:	
Beef	3 oz.
Buttermilk	1/8 c
Vegetable fat	1 Tbsp.
Bhagi:	
Cabbage	½ c
Onion	1 tsp.
Vegetable fat	2 tsp.
Pear	1 medium
Milk	1 c

Dinner

Stew:	
Beef	3 oz.
Pumpkin	1/3 c
Vegetable fat	2 tsp.
Bhagi:	
Tomato	¼ c
Potato	½ medium
Onion	1 tsp.
Vegetable fat	2 tsp.
Chappati, whole wheat	2 slices equivalent
Firni:	
Milk	1 c
Sugar	1 Tbsp.
Rice	1 Tbsp.
Butter	1 pat

V. Menu - Friday

Breakfast

Orange	1 medium
Bhagi:	
Pumpkin	2/3 c
Onion	1 tsp.
Vegetable fat	1 tsp.
Puree:	
Whole wheat flour	2 slices equivalent
Vegetable fat	3 tsp.
Halva:	
Cream of wheat	½ c
Sugar	2 Tbsp.
Butter	2 pat
Milk, whole	1 c

Luncheon

Tossed Salad:	
Lettuce	1/8 head
Cucumber	2 slices
Radish	1
Vermicelli & Minced meat	
Vermicelli	½ c
Minced meat	3 oz.
Onion	1 tsp.
Vegetable fat	2 tsp.
Beans:	
Green beans	½ c
Onion	1 tsp.
Vegetable fat	1 tsp.
Rasgoola:	
Cream, half & half	1/8 c
Yoghart	1 Tbsp.
Sugar syrup	1/8 c
Milk	1 c

Dinner

Khichree:	
Rice	½ c
Lentils	¼ c
Onion	1 tsp.
Vegetable fat	1 tsp.
Cheese Omelette:	
Cheese	1 cu. inch
Egg	1½
Butter	2 pats

Dinner - continued

Tomato Chutney:		
	Tomato ketchup (Tomato, sugar, vineger, salt, onions, spices)	
Halva:		
	Carrot	½ c
	Sugar	1 Tbsp.
	Milk	½ c
	Butter	2 pats
Kima and Meethi:		
	Beef, ground	2 oz.
	Meethi (green leafy)	¼ c
	Vegetable fat	1 tsp.

VI. Menu - Saturday

Breakfast

Grapefruit	½ medium
Puffed wheat	1 c
Cream, half and half	½ c
Muffin, whole grain wheat	1
Sugar	2 tsp.
Milk, whole	1 c

Luncheon

Rice	½ c
Dal:	
Lentils	¼ c
Onion	1 tsp.
Butter	1 pat
Beef patties:	
Ground beef	3 oz.
Potato	1 medium
Onion	1 tsp.
Vegetable fat	1 Tbsp.
Bhagi:	
Spinach	½ c
Onion	1 tsp.
Vegetable fat	1 Tbsp.
Custard	1 c (1 egg and 1 c milk)

Dinner

Pasinde:	
Beef	3 oz.
Buttermilk	1/8 c
Onion	1 tsp.
Vegetable fat	1 Tbsp.
Bhagi:	
Okra	½ c
Onion	1 tsp.
Vegetable fat	1 Tbsp.
Chappati, whole wheat	2 slices equivalent
Muzaffer:	
Rice	¼ c
Sugar	4 tsp.
Butter	2 pats
Milk, whole	1 c

VII. Menu - Sunday

Breakfast

Apple	1 medium
Sandwich:	
Liver, lamb	1 oz.
Toast, whole wheat	2 slices
Butter	2 pats
Milk, whole	1 c

Luncheon

Stew:	
Beef	3 oz.
Potato	½ medium
Tomato	½ c
Onion	1 tsp.
Vegetable fat	4 tsp.
Sliced cucumbers)	6 slices
Onion rings)	¼ medium -- 2 tsp.
Guava	1 medium
Hot rolls	2
Milk, whole	1 c

Dinner

Salad:	
Tomato	½ medium (2 slices)
Lettuce	2 small leaves
Palao:	
Rice	½ c
Green peas	1/8 c
Onion	1 tsp.
Vegetable fat	4 tsp.
kurma:	
Beef	3 oz.
Potato	½ medium
Buttermilk	1/8 c
Onion	1 tsp.
Vegetable fat	4 tsp.
Custard, baked	1 c (1 egg and 1 c milk)

One Week's Tea Snacks for Karachi College of Home Economics

Tea Snacks

Monday	
Milk, whole	1 c
Samosa	1
Pears	1
Tuesday	
Chocolate milk	1 c
Pakora in Yoghart	2
Grapes	½ c
Wednesday	
Milk, whole	1 c
Toast and jelly	1 serving
Apricot	1
Thursday	
Grape fruit	½ medium
Biscuit	1
Tea	
Friday	
Milk, whole	1 c
Sweet Puree	1
Peach	1 medium
Saturday	
Plums	1 medium
Cupcake	1
Lemon Squash	1 c
Sunday	
Milk, whole	1 c
Doughnut	1
Papaya	½ c, diced

APPENDIX C

Estimation of Nutritive Value of Foods
Basic Four Groups

Monday

1. Milk Group

Breakfast	
Milk	1 sv.
Half & Half	½ sv.
Lunch	
Milk	1 sv.
Dinner	
Half & Half	½ sv.

Total: 3 servings (adequate)

2. Meat Group

Lunch	
Beef	1 sv.
Lentils	¼ sv.
Dinner	
Lamb	1 sv.

Total: 2¼ servings (adequate)

3. Fruit & Vegetable Group

Green & Yellow		High Vit C		Other	
Apricot	½ sv.	Cantaloupe	¼ sv.	Apple	½ sv.
Peach	½ sv.	Tomato	½ sv.	Beets	½ sv.
Meethi	½ sv.	Green Pepper	½ sv.	Eggplant	½ sv.
	1½ sv.		1¼ sv.		1½ sv.

Total: 4¼ servings (adequate)

4. Bread-Cereal Group

Breakfast	
Wheat Porridge	1 sv.
Toast-white, wheat	2 sv.
Lunch	
Chappati	2 sv.
Dinner	
Steamed Rice	1 sv.

Total: 6 servings

Estimation of Nutritive Value of Foods
Basic Four Groups

Tuesday

1. Milk Group

Breakfast
Milk — 1-1/8 sv.

Lunch
Milk — 1 sv.
Buttermilk — 1/8 sv.

Dinner
Ice cream — ½ sv.

Total: 2-3/4 servings (adequate)

2. Meat Group

Breakfast
Egg — ½ sv.

Lunch
Beef — 1 sv.

Dinner
Brain — 1 sv.

Total: 2½ servings (adequate)

3. Fruit & Vegetable Group

Green & Yellow		High Vit C		Other	
Pear	1 sv.	Tomatoes	½ sv.	Peas	½ sv.
Carrots	½ sv.				
Palak (green leafy)	1 sv.				
	2½ sv.		½ sv.		½ sv.

Total: 3½ servings

4. Bread-Cereal Group

Breakfast
Toast, white, wheat — 2 sv.

Lunch
Rice — 1 sv.

Dinner
Paratha — 2 sv.

Total: 5 servings (adequate)

Estimation of Nutritive Value of Foods
Basic Four Groups

Wednesday

1. Milk Group

Breakfast		
Milk	1 sv.	
Lunch		
Milk	1 sv.	
Dinner		
Custard	1 sv.	
	Total:	3 servings (adequate)

2. Meat Group

Lunch		
Roast beef	1 sv.	
Dinner		
Lentils	¼ sv.	
Ground beef	1 sv.	
Egg-custard	½ sv.	
	Total:	2-3/4 servings

3. Fruit & Vegetable Group

Green & Yellow		High Vit C		Other	
Potato	1¼ sv.	Grapefruit	1 sv.	Eggplant	¼ sv.
Turnip	1 sv.	Tomato	½ sv.		
	2¼ sv.		1½ sv.		¼ sv.

Total: 4 servings (adequate)

4. Bread-Cereal Group

Breakfast		
Paratha	1 sv.	
Lunch		
Hot Rolls	2 sv.	
Dinner		
Rice	1 sv.	
	Total:	4 servings (adequate)

Estimation of Nutritive Value of Foods
Basic Four Groups

Thursday

1. Milk Group

Breakfast		
Milk, whole	1 sv.	
Lunch		
Milk, whole	1 sv.	
Buttermilk	1/8 sv.	
Dinner		
Milk, whole	1 sv.	
	Total:	3-1/8 servings (adequate)

2. Meat Group

Breakfast		
Egg	½ sv.	
Lunch		
Lentils	¼ sv.	
Beef	1 sv.	
Dinner		
Beef	1 sv.	
	Total:	3¼ servings (adequate)

3. Fruit & Vegetable Group

Green & Yellow		High Vit C		Other	
Pumpkin	½ sv.	Cabbage	1 sv.	Apple	½ sv.
Potato	½ sv.	Tomato	½ sv.	Pear	1 sv.
	1 sv.		1½ sv.		1½ sv.

Total: 4 servings

4. Bread-Cereal Group

Breakfast		
Toast, whole, white	2 sv.	
Doughnut	1 sv.	
Lunch		
Rice	1 sv.	
Dinner		
Chappati	2 sv.	
	Total:	6 servings (adequate)

Estimation of Nutritive Value of Foods
Basic Four Groups

Friday

1. Milk Group

Breakfast
Milk, whole 1 sv.

Lunch
Milk, whole 1 sv.
Cream, half & half 1/8 sv.

Dinner
Cheese 2/3 sv.
Milk, whole ¼ sv.
Total: 3 servings (adequate)

2. Meat Group

Lunch
Meat, minced 1 sv.

Dinner
Lentils ¼ sv.
Egg 3/4 sv.
Beef 1 sv.
Total: 3 servings

3. Fruits & Vegetable Group

Green & Yellow		High Vit C		Other	
Pumpkin	1¼ sv.	Orange	1 sv.	Carrots	1 sv.
Lettuce	¼ sv.			Green Beans	1 sv.
Meethi (green leafy)	¼ sv.				
	1-3/4 sv.		1 sv.		2 sv.

Total: 4-3/4 servings

4. Bread-Cereal Group

Breakfast
Puree, whole wheat 2 sv.
Cream of wheat 1 sv.

Lunch
Vermicelli 1 sv.

Dinner
Rice 1 sv.
Total: 5 servings (adequate)

Estimation of Nutritive Value of Foods
Basic Four Groups

Saturday

1. Milk Group

Breakfast

Milk, whole	1 sv.
Cream, half & half	½ sv.

Lunch

Custard	1 sv.

Dinner

Buttermilk	1/8 sv.
Milk, whole	1 sv.

Total: 3-5/8 servings (adequate)

2. Meat Group

Lunch

Lentils	¼ sv.
Ground beef	1 sv.
Egg	½ sv.

Dinner

Beef	1 sv.

Total: 2-3/4 servings

3. Fruits & Vegetables Group

Green & Yellow		High Vit C		Other	
Potato	1 sv.	Grapefruit	1 sv.	Okra	1 sv.
Spinach	1 sv.				
	2 sv.		1 sv.		1 sv.

Total: 4 servings

4. Bread-Cereal Group

Breakfast

Puffed Wheat	1 sv.
Muffin	1 sv.

Lunch

Rice	1 sv.

Dinner

Chappati	2 sv.
Rice	½ sv.

Total: 5½ servings

Estimation of Nutritive Value of Foods
Basic Four Groups

Sunday

1. Milk Group

Breakfast
Milk, whole — 1 sv.

Lunch
Milk, whole — 1 sv.

Dinner
Buttermilk — 1/8 sv.
Custard, milk — 1 sv.

Total: 3-1/8 servings (adequate)

2. Meat Group

Breakfast
Liver, lamb — ½ sv.

Lunch
Beef — 1 sv.

Dinner
Beef — 1 sv.
Egg-custard — ½ sv.

Total: 3 servings (adequate)

3. Fruits & Vegetables Group

Green & Yellow		High Vit C		Other	
Potato	3/4 sv.	Tomato	1 sv.	Apple	½ sv.
Lettuce	¼ sv.	Guava	1 sv.	Cucumber	¼ sv.
Green Peas	¼ sv.				
	1¼ sv.		2 sv.		3/4 sv.

Total: 4 servings (adequate)

4. Bread-Cereal Group

Breakfast
Toast, whole wheat — 2 sv.

Lunch
Hot Rolls — 2 sv.

Dinner
Rice — 1 sv.

Total: 5 servings (adequate)

Calculation of Nutritive Value of Foods Using Tables

Monday

Food	Approximate Measure	Food Energy Calories	Protein Grams	Fat Grams	Carbohydrates Grams	Calcium Mg.	Iron Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
Apricot-fresh	1 whole	18	-	-	0.5	6	0.2	963	0.01	0.01	0.2	3
Cantaloupe-fresh	1/8 c	4	0.1	-	0.8	3	0.1	620	0.01	0.01	0.1	6
Apple-fresh	¼ c	21	0.1	0.1	5.3	2	0.1	32	0.01	0.01	0.1	2
Peach-fresh	¼ c	16	-	-	4.0	4	0.2	557	0.01	0.02	0.4	3
Milk, whole	2 c	330	18.0	20.0	24.0	570	0.2	780	0.16	0.84	0.4	4
Cream, half & half	1 c	330	8.0	29.0	11.0	259	0.1	1190	0.07	0.39	0.1	2
Butter	5 pats	250	-	30.0	-	5	-	1150	-	-	-	-
Vegetable fat	3 Tbsp.	330	-	36.0	-	-	-	-	-	-	-	-
Wheat porridge	½ c	87	2.0	-	20.0	9	9.8	-	0.08	0.03	1.0	-
Toast, Wheat-white	4 slices	220	8.0	4.0	44.0	92	2.0	-	0.24	0.20	2.8	-
Steamed Rice	½ c	102	2.0	-	22.0	7	0.2	-	0.05	0.01	0.9	-
Lentils	¼ c	169	12.0	6.0	30.0	17	3.7	285	0.28	0.12	1.1	2
Beef, minced	3 oz.	245	23.0	16.0	-	10	2.9	30	0.04	0.18	3.5	-
Lamb, Rib chop	2 oz.	209	12.0	17.0	-	5	1.5	-	0.07	0.13	2.8	-
Sugar	4 tsp.	66	-	-	16.0	-	-	-	-	-	-	-
Sweet Pepper	1 whole	15	1.0	-	3.0	6	0.4	260	0.05	0.05	0.3	79
Meethi, green leafy	¼ c	11	2.0	-	2.0	56	0.9	5300	0.03	0.09	0.3	13
Beets	¼ c	17	-	-	4.0	9	0.3	8	0.01	0.02	0.1	3
Eggplant	¼ c	24	1.0	2.0	5.0	15	0.4	30	0.04	0.05	0.6	5
Tomato	¼ c	11	-	-	2.0	7	0.4	635	0.03	0.02	0.4	10
Onion	4 tsp.	20	-	-	5.0	17	0.2	27	0.01	0.01	0.1	3
Total		2495	89.2	152.9	203.1	1099	14.6	11867	1.20	2.19	15.2	135
Recommended Allowance		2400	75.0			1300	15.0	5000	1.20	1.9	16.0	80
Difference		+95	+14.2			-201	-0.4	+6867	adequate	+0.29	-0.8	+55
Tea Snack		626	20.0	50.0	49.0	315	2.2	443	0.21	0.56	2.3	10
Total for Day		3121	109.2	202.9	252.1	1414	16.8	12310	1.41	2.75	17.5	145

Calculation of Nutritive Value of Foods Using Tables

Tuesday

Food	Approximate Measure	Food Energy Calories	Protein Grams	Fat Grams	Carbohydrates Grams	Calcium Mg.	Iron Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg
Pear-fresh	1 whole	180	1.0	1.0	25.0	13	0.5	30	0.04	0.07	0.2	7
Milk, whole	2-1/8 c	350	19.0	21.0	25.0	605	0.2	828	0.17	0.89	0.4	4
Buttermilk	1/8 c	11	1.0	-	1.0	37	-	1	0.01	0.05	-	-
Ice Cream (71 gms)	2/3 c	145	3.0	9.0	15.0	87	0.1	370	0.03	0.13	0.1	1
Butter	2 pats	100	-	12.0	-	2	-	460	-	-	-	-
Vegetable fat	6 Tbsp.	660	-	72.0	-	-	-	-	-	-	-	-
Egg	1	80	6.0	6.0	-	27	1.1	590	0.05	0.15	-	-
Toast, wheat, white	4 slices	220	8.0	4.0	44.0	92	2.0	-	0.24	0.20	2.8	-
Rice	½ c	102	2.0	-	22.0	7	0.2	-	0.05	0.01	0.9	-
Ground Beef	3 oz.	245	23.0	16.0	-	10	2.9	30	0.04	0.18	3.5	-
Brain, lamb	3 oz.	125	10.4	8.6	0.8	16	3.6	-	0.23	0.26	4.4	18
Tomato Chutney	2 Tbsp.	33	0.6	-	7.6	6	0.1	-	-	-	-	-
Carrots	¼ c	11	-	-	2.0	9	0.2	4532	0.02	0.02	0.2	2
Peas	¼ c	27	2.0	-	5.0	9	0.7	287	0.10	0.05	0.9	6
Tomato	½ c	23	1.0	-	5.0	14	0.8	1270	0.07	0.04	0.9	20
Palak, green leafy	½ c	22	3.0	-	3.0	112	1.8	10600	0.07	0.18	0.5	27
Onion	4 tsp.	20	-	-	5.0	17	0.2	27	0.01	0.01	0.1	3
Total		2179	80.0	149.6	160.4	1063	14.4	19025	1.13	2.24	14.9	88
R. D. A.		2400	75.0			1300	15.0	5000	1.20	1.9	16.0	80
Difference		-221	+5.0			-237	-0.6	+14025	-0.07	+0.34	-1.1	+8
Tea Snack		664	22.0	31.0	74.0	374	4.4	618	0.43	0.65	1.5	8
Total for Day		2843	102.0	108.6	234.4	1437	18.8	19643	1.56	2.89	16.4	96

Calculation of Nutritive Value of Foods Using Tables

Wednesday

Food	Approximate Measure	Food Energy Calories	Protein Grams	Fat Grams	Carbohydrates Grams	Calcium Mg.	Iron Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
Grapefruit	½ med.	55	1.0	-	14.0	21	0.5	590	0.05	0.22	0.2	48
Milk, whole	2 c	330	18.0	20.0	24.0	570	0.2	780	0.16	0.84	0.4	4
Custard	1 c	285	13.0	14.0	28.0	270	1.0	870	0.10	0.47	0.2	1
Butter	1 pat	50	-	6.0	-	1	-	230	-	-	-	-
Vegetable fat	4 Tbsp.	440	-	48.0	-	-	-	-	-	-	-	-
Paratha, white, wheat	1 slice	55	2.0	1.0	11.0	23	0.5	-	0.06	0.05	0.7	-
Hot Rolls	2	230	6.0	4.0	40.0	56	1.4	-	0.22	0.14	1.6	-
Steamed Rice	½ c	102	2.0	-	22.0	7	0.2	-	0.05	0.01	0.9	-
Roast, beef	3 oz.	390	16.0	36.0	-	7	2.1	70	0.04	0.13	3.0	-
Ground beef	3 oz.	245	23.0	16.0	-	10	2.9	30	0.04	0.18	3.5	-
Lentils	¼ c	169	12.0	0.6	30.0	17	3.7	285	0.28	0.12	1.1	2
Potato	1¼	131	4.0	-	29.0	12	1.0	-	0.16	0.06	2.5	28
Broth, beef	¼ c	2	-	-	-	0.5	0.2	-	-	0.01	0.1	-
Tomato	½ c	23	1.0	-	5.0	14	0.8	1270	0.07	0.04	0.9	20
Turnip	½ c	20	-	-	4.0	31	0.4	-	0.03	0.04	0.3	14
Eggplant	1/8 c	12	-	0.1	3.0	8	0.2	15	0.02	0.03	0.3	3
Green leafy	1/8 c	5	1.0	-	1.0	28	0.4	2650	0.02	0.04	0.1	7
Onion	4 tsp.	20	-	-	5.0	17	0.2	27	0.01	0.01	0.1	3
Total		2564	99.0	145.7	216.0	1100.5	15.7	6817	1.31	2.19	15.9	130
R. D. A.		2400	75.0			1300	15.0	5000	1.2	1.9	16.0	80
Difference		+164	+24.0			-200	+0.7	+1817	+0.11	+0.29	-0.1	+50
Tea Snacks		288	11.0	11.0	41.0	316	0.9	1353	0.15	0.48	1.1	6
Total for Day		2852	110.0	156.7	257	1416.5	16.6	8170	1.46	2.67	17.1	136

Calculation of Nutritive Value of Foods Using Tables

Thursday

Food	Approximate Measure	Food Energy Calories	Protein Grams	Fat Grams	Carbohydrates Grams	Calcium Mg.	Iron Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
Apple, fresh	1 med.	70	-	-	18	8	0.4	50	0.04	0.02	0.1	3
Pear	1 med.	100	1	1.0	25	13	0.5	30	0.04	0.07	0.2	7
Milk, whole	3 c.	495	27	30.0	36	855	0.3	870	0.24	1.26	0.6	6
Buttermilk	1/8 c.	11	1	-	1	37	-	1	0.01	0.05	-	-
Egg, omelette	1	106	6	8.0	1	50	1.3	640	0.05	0.17	-	-
Butter	2 pats	100	-	12.0	-	2	-	460	-	-	-	-
Vegetable fat	5 Tbsp.	550	-	60.0	-	-	-	-	-	-	-	-
Doughnuts	1 (32 gm)	136	2	7.0	17	23	0.2	40	0.05	0.04	0.4	-
Toast, whole,white	4 slices	220	8	4.0	44	92	2.0	-	0.24	0.20	2.8	-
Rice	½ c	102	2	-	22	7	0.2	-	0.05	0.01	0.9	-
Beef	6 oz.	490	46	32.0	-	20	5.8	60	0.08	0.36	7.0	-
Lentils	¼ c	169	12	0.6	30	17	3.7	285	0.28	0.12	1.1	2
Cabbage	½ c	20	1	-	4	39	0.4	75	0.04	0.04	0.2	26
Pumpkin	1/3 c	25	1	-	6	15	0.5	2583	0.01	0.05	0.4	-
Tomato	¼ c	11	-	-	2	7	0.4	635	0.03	0.02	0.4	10
Potato	½ med.	52	1	-	12	5	0.4	-	0.06	0.02	1.0	11
Sugar	1 Tbsp.	50	-	-	12	-	-	-	-	-	-	-
Onion	4 tsp.	20	-	-	5	17	0.2	27	0.01	0.01	0.1	3
Total		2747	108	154.0	235	1207	16.3	5756	1.23	2.44	15.2	68
R. D. A.		2400	75			1300	15.0	5000	1.20	1.9	16.0	80
Difference		+347	+33			-93	+1.3	+756	+0.03	+0.54	-0.8	-12
Tea Snacks		275	4	6.4	50	118	1.1	90	0.16	0.15	1.1	76
Total for Day		3022	112	160.4	285	1325	17.4	5846	1.39	2.59	16.3	144

Friday

Food	Approximate Measure	Food Energy Calories	Protein Grams	Fat Grams	Carbohydrates Grams	Calcium Mg.	Iron Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
Orange	1 med.	70	1	0.3	17	51	0.6	290	0.12	0.04	0.4	77
Milk, whole	2¼ c	371	20	22.0	27	641	0.2	877	0.18	0.94	0.4	4
Cream, half & half	1/8 c	40	-	4.0	2	32	-	140	-	0.04	-	-
Cheese	1 cu. inch	70	4	6.0	-	133	0.2	230	-	0.08	-	-
Egg	1½	159	9	12.0	1	75	1.9	960	0.07	0.05	-	-
Butter	6 pats	300	-	36.0	-	6	-	1380	-	-	-	-
Vegetable fat	3 Tbsp.	330	-	36.0	-	-	-	-	-	-	-	-
Puree, whole, wheat	2 sl. equi.	110	4	2.0	22	46	1.0	-	0.12	0.10	1.4	-
Cream of wheat	½ c	52	2	-	11	15	0.4	-	0.05	0.04	0.5	-
Rice	½ c	102	2	-	22	7	0.2	-	0.05	0.01	0.9	-
Minced meat	3 oz.	409	39	26.0	-	16	4.7	50	0.06	0.30	5.8	-
Lentils	¼ c	169	12	0.6	30	17	3.7	285	0.28	0.12	1.1	2
Pumpkin	2/3 c	50	2	-	12	30	1.0	5166	0.02	0.10	0.8	-
Lettuce	1/8 hd.	4	-	-	1	6	Trace	150	0.01	0.02	Trace	2
Carrots	½ c	22	Trace	Trace	4	19	0.5	9065	0.03	0.03	0.4	6
Radish	1	2	Trace	Trace	1	4	0.1	2	Trace	Trace	Trace	2
Green Beans	½ c	13	1	-	3	25	0.4	415	0.04	0.06	0.3	9
Tomato Chutney	2 Tbsp.	33	-	-	8	6	0.1	-	-	-	-	-
Vermicelli	½ c	78	3	Trace	16	5	0.6	-	0.09	0.05	0.7	-
Onion	4 tsp.	20	-	-	5	17	0.2	27	0.01	0.01	0.1	3
Sugar	5 Tbsp.	250	-	-	60	-	-	-	-	-	-	-
Total		2654	99	145.0	242	1151	15.8	19037	1.13	1.99	12.8	105
R. D. A.		2400	75			1300	15.0	5000	1.2	1.9	16.0	80
Difference		+254	+24			-149	+0.8	+14037	-0.07	+0.09	-3.2	+24
Tea Snacks		792	24	38.0	75	334	5.1	1995	0.46	0.70	3.2	11
Total for Day		3446	123	183.0	317	1485	20.9	21032	1.59	2.69	16.0	116

Saturday

Food	Approximate Measure	Food Energy Calories	Protein Grams	Fat Grams	Carbohydrates Grams	Calcium Mg.	Iron Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
Grapefruit	½ med.	75	1.0	0.4	19	41	0.4	20	0.07	0.04	0.4	76
Milk, whole	2¼ c	371	20.0	22.0	27	641	0.2	877	0.18	0.94	0.4	4
Cream, half & half	½ c	165	4.0	14.0	5	129	-	595	0.03	0.19	-	1
Buttermilk	1/8 c	11	1.0	-	1	37	-	1	0.01	0.05	-	-
Custard	1 c	285	13.0	14.0	28	278	1.0	870	0.10	0.47	0.2	1
Butter	3 pats	150	-	18.0	-	3	-	690	-	-	-	-
Vegetable fat	4 Tbsp.	440	-	48.0	-	-	-	-	-	-	-	-
Puffed Wheat	1 c	43	1.3	-	10	6	0.5	-	0.07	0.02	0.8	-
Muffin, whole grain	1	135	4.0	5.0	19	74	0.7	60	0.08	0.11	0.7	Trace
Rice	3/4 c	153	3.0	-	33	9	0.3	-	0.06	0.01	1.5	-
Chappati, Wh. wheat	2 slices	110	4.0	2.0	22	46	1.0	-	0.12	0.10	1.4	-
Lentils	¼ c	169	12.0	0.6	30	17	3.7	285	0.28	0.12	1.1	2
Beef	6 oz.	490	46.0	32.0	-	20	5.8	60	0.08	0.36	7.0	-
Potato	1 med.	105	2.0	-	24	14	0.9	20	0.12	0.04	1.3	17
Spinach	½ c	22	3.0	-	3	112	1.8	10600	0.07	0.18	0.5	27
Okra (4 pods)	½ c	14	0.7	Trace	3	35	0.3	315	0.02	0.02	0.4	9
Onion	5 tsp.	25	-	-	6	21	0.2	33	0.01	0.01	0.1	4
Sugar	2 Tbsp.	100	-	-	24	-	-	-	-	-	-	-
Total		2863	115.0	156.0	254	1483	16.08	14426	1.30	2.66	15.8	141
R. D. A.		2400	75.0			1300	15.0	5000	1.20	1.9	16.0	80
Difference		+463	+40.0			+183	+1.8	+9426	+0.10	+0.76	-0.2	+61
Tea Snacks		245	3.0	3.0	45	69	0.5	250	0.05	0.06	0.4	10
Total for Day		3108	118.0	159.0	299	1552	17.3	14676	1.35	2.72	16.2	151

Calculation of Nutritive Value of Foods Using Tables

Sunday

Food	Approximate Measure	Food Energy Calories	Protein Grams	Fat Grams	Carbohydrates Grams	Calcium Mg.	Iron Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
Apple	1 med.	76	0.4	0.5	19.0	8	0.4	120	0.05	0.04	0.2	6
Guava	1 med.	49	0.7	0.4	12.0	21	0.5	180	0.05	0.03	0.8	212
Milk, whole	2 c	330	18.0	20.0	24.0	570	0.2	780	0.16	0.84	0.4	4
Buttermilk	1/8 c	11	1.0	-	1.0	37	-	1	0.01	0.05	-	-
Custard	1 c	285	13.0	14.0	28.0	278	1.0	870	0.10	0.47	0.2	1
Butter	2 pats	100	-	12.0	-	2	-	460	-	-	-	-
Vegetable fat	4 Tbsp.	440	-	48.0	-	-	-	-	-	-	-	-
Toast, wheat, whole	2 slices	110	4.0	2.0	22.0	46	1.0	-	0.12	0.10	1.4	-
Hot Rolls	2	230	6.0	4.0	40.0	56	1.4	-	0.22	0.14	1.6	-
Rice	½ c	102	2.0	-	22.0	7	0.2	-	0.05	0.01	0.9	-
Liver, lamb	1 oz.	39	6.0	1.0	1.0	2	3.6	14310	0.11	0.93	4.8	9
Beef	6 oz.	490	46.0	32.0	-	20	5.8	60	0.08	0.36	7.0	-
Potato	3/4 med.	79	1.0	-	18.0	9	0.6	15	0.09	0.03	0.9	12
Tomato	½ c & ½ med	34	2.0	Trace	7.0	20	1.1	1875	0.10	0.07	1.1	33
Sliced cucumbers	6 slices	6	0.4	-	1.0	5	0.2	-	0.02	0.02	0.1	4
Lettuce leaves	2 small	4	0.3	-	0.7	6	0.1	135	0.01	1.02	-	2
Green Peas	1/8 c	14	1.0	-	2.4	4	0.4	144	0.05	0.03	0.4	3
Onions	5 tsp.	25	-	-	6.0	21	0.2	33	0.01	0.01	0.1	4
Total		2424	102.0	133.0	204.0	1112	16.7	18983	1.23	3.15	19.9	290
R. D. A.		2400	75.0	-	-	1300	15.0	5000	1.20	1.90	16.0	80
Difference		+24	+27.0	-	-	-188	+1.7	+13983	+0.03	+1.25	+3.9	+210
Tea Snacks		336	3.0	16.0	37.0	326	0.6	2025	0.17	0.50	0.9	53
Total for Day		2760	105.0	149.0	241.0	1438	17.3	21008	1.40	3.65	20.8	343

Calculation of Nutritive Value of Daily Tea Snacks

Tea Snacks

Food	Appr. Meas.	F.E. Cal.	Pr. Gm	Fa. Gm	Car. Gm	Cal. Mg	Fe. Mg	Vit.A I.U.	Thi. Mg	Rib. Mg	Nia. Mg	As. Acid Mg
I.												
Milk, whole	1c	165	9	10	12	285	0.1	390	0.08	0.42	0.2	2
Pear, med.	1	100	1	1	25	13	0.5	30	0.04	0.07	0.2	7
Beef, ground	1oz.	82	8	15	-	3	1.0	10	0.01	0.06	1.2	-
Flour, wh. wheat	1/8c	49	2	-	10	6	0.5	-	0.08	0.01	0.7	-
Veg. fat	2Tbsp.	220	-	24	-	-	-	-	-	-	-	-
Onion												
Total		626	20	50	49	315	2.2	443	0.21	0.56	2.3	10
II.												
Chocolate Milk	1c	190	8	6	27	270	0.4	210	0.09	0.41	0.2	2
Grapes	½c	50	-	-	13	9	0.3	75	0.04	0.02	0.2	4
Gram-flour	1/6c	169	12	-	30	17	3.7	285	0.28	0.12	1.1	2
Fat	2Tbsp.	220	-	24	-	-	-	-	-	-	-	-
Yoghart	¼c	30	2	1	3	74	-	42	0.02	0.10	-	-
Onion	1tsp.	5	-	-	1	4	-	6	-	-	-	-
Total		664	22	31	74	374	4.4	618	0.43	0.65	1.5	8
III.												
Apricot, med.	1	18	-	-	5	6	0.2	963	0.01	0.01	0.2	3
Milk, whole	1c	165	9	10	12	285	0.1	390	0.08	0.42	0.2	2
Toast	1sl.	55	2	1	11	23	0.5	-	0.06	0.05	0.7	-
Jelly	1Tbsp.	50	-	-	13	2	0.1	-	-	-	-	-
Total		288	11	11	41	316	0.9	1353	0.15	0.48	1.1	6
IV.												
Grapefruit	½med.	75	1	0.4	19	41	0.4	20	0.07	0.04	0.4	76
Biscuit	1	130	3	4	18	61	0.7	-	0.09	0.09	0.7	-
Cream, half & half	1Tbsp.	20	-	2	1	16	-	70	-	0.02	-	-
Sugar	1Tbsp.	50	-	-	12	-	-	-	-	-	-	-
Total		275	4	6.4	50	118	1.1	90	0.16	0.15	1.1	76
V.												
Milk, whole	1c	165	9	10	12	285	0.1	390	0.08	0.42	0.2	2
Peach	1	35	1	-	10	9	0.5	1320	0.02	0.05	1.0	7
Flour, allpurpose	1/8c	50	1	-	10	2	0.4	-	0.06	0.03	0.5	-
Lentils	¼c	169	12	-	30	17	3.7	285	0.28	0.12	1.1	2
Veg. fat	2Tbsp.	220	-	24	-	-	-	-	-	-	-	-
Sugar	2Tbsp.	100	-	-	12	-	-	-	-	-	-	-
Almonds	1Tbsp.	53	1	4	1	21	0.4	-	0.02	0.08	0.4	-
Total		792	24	38	75	334	5.1	1995	0.46	0.70	3.2	11
VI.												
Plums	1	30	-	-	7	10	0.3	200	0.04	0.02	0.3	3
Cupcakes	1	160	3	3	31	58	0.2	50	0.01	0.04	0.1	-
Lemon Juice	1Tbsp.	5	-	-	1	1	-	-	-	-	-	7
Sugar	1Tbsp.	50	-	-	6	-	-	-	-	-	-	-
Total		245	3	3	45	69	0.5	250	0.05	0.06	0.4	10
VII.												
Milk	1c	165	0.9	10	12	285	0.1	390	0.08	0.42	0.2	2
Doughnut	1	136	2.1	67	16	23	0.2	40	0.05	0.04	0.4	-
Papaya	½c	35	-	-	9	18	0.3	1595	0.04	0.04	0.3	51
Total		336	3.0	16	37	326	0.6	2025	0.17	0.50	0.9	53

APPENDIX D

Experimental Recipe

Kurma-Meat

Amount	Ingredient	Method
1 lb.	Onions	Saute' sliced onions in a 6-quart kettle until light brown
1 lb.	Vegetable fat	
	Add	
1 Tbsp.	Ginger	Fry the spices for 5 minutes, sprinkling a few drops of water to avoid burning.
½ Tbsp.	Tumeric	
1 Tbsp.	Paprika	
1 Tbsp.	Salt	
	Add	
6 lbs.	Beef-cubes	Brown the meat with continuous stirring for 10 minutes. Then add yoghart. Cook until the fat separates from the sides of the kettle. Reduce heat, cover, and simmer until meat becomes tender.
4 cloves	Garlic, chopped	
1 lb.	Yoghart	
	Now Add	
2 cups	Water	

Estimated Time: 2 hours at 300° F

Estimated Yield: 3 quarts (25-½-cup servings)

Experimental Recipe

Vegetable Curry

Amount	Ingredient	Method
½ lb. 1 cup	Onions Mazola, or Corn Oil	Saute' sliced onions in a cup of Mazola using a 6-quart kettle.
	Add the Spices	
1 tsp. 2 tsp. 1 Tbsp. 1 tsp.	Ginger Paprika Salt Cayenne Pepper	Fry for 10 minutes adding a few drops of water to avoid the burning of spices.
	Brown for 5 Minutes	
2 lbs.	Potatoes, fresh	Wash, peel and cube the potatoes.
	Add	
3 lbs. 2 cups 6	Cauliflower, fresh Water Green Chilis, chopped	Cut in cubes and wash. Cover the kettle and simmer on low heat for 30 minutes.
	Spread on Surface	
1 lb. 10 ozs.	Tomatoes, fresh Green Peas, frozen	Washed and sliced. Cook on low heat for 10 minutes or until the peas are tender.

Estimated Time: 1 hour

Estimated Yield: Approximately 5 quarts (25-3/4 cup servings)

Experimental Recipe

Firni-Rice Pudding

Amount	Ingredient	Method
3 qts.	Milk, whole	Use a heavy-bottom, 6-quart kettle to boil milk for 20 minutes.
	Add	
1 cup	Rice, soaked for an hour, and finely ground.	Stir continuously while thickening the mixture for 20 minutes.
	Add	
3 cups	Sugar, granulated	Continue stirring for 5 minutes. Remove from heat and cool.
	Sprinkle	
½ cup	Almonds, sliced	Serve with sliced almonds sprinkled on top.

Estimated Time: 45 minutes

Estimated Yield: 3 quarts (25-½ cup servings)

Experimental Recipe

Puri-Fried Bread

Amount	Ingredient	Method
2½ lbs. ½ lb. 1 tsp.	All-purpose flour Whole wheat flour Salt	Mix together the dry ingredients.
	Cut-in	
4 Tbsp.	Vegetable fat	
	Add, at intervals	
3 2/3 cups	Water	Knead the dough, cover with a towel and let rise for an hour. Roll the dough, 1/10 inch thick and cut into 4-inch diameter pieces.
	Deep-fat-fry in	
1 qt.	Mazola or Corn Oil	Light brown in color.

Estimated Time: 2 hours

Estimated Yield: 75 puris (25-3 puri servings)

Revised Recipe

Kurma-Meat

Amount	Ingredient	Method
1 lb. 3/4 lb.	Onions Vegetable fat	Saute' sliced onions in a 6-quart kettle until light brown, 20 minutes.
	Add	
1 tsp. 1 Tbsp. 1 Tbsp. 1 tsp. 1 Tbsp.-1 tsp.	Ginger Paprika Curry Powder Chili Powder Salt	Fry spices for 10 minutes, sprinkling a few drops of water to avoid burning.
	Add	
6 lbs. 4 cloves 3/4 lb.	Beef-cubes Garlic, chopped Yoghart	Brown the meat, stirring for 20 minutes. Then add yoghart. Cook for 20 minutes or until the fat separates from sides of the kettle.
	Add	
3 cups	Water	Reduce heat, cover and simmer until the meat becomes tender.

Estimated Time: 2 hours

Estimated Yield: 3 quarts (25-½ cup servings)

Revised Recipe

Vegetable Curry

Amount	Ingredient	Method
1 lb. 1½ cups	Onions Mazola, or Corn Oil	Saute' sliced onions in 1½ cups of corn oil using a 6-quart kettle.
	Add the following Spices	
1 Tbsp. 1 Tbsp. 1 tsp. 1 Tbsp. 1 tsp. 1 Tbsp.	Ginger Paprika Chili Powder Curry Powder Tumeric Salt	Fry for 15 minutes adding a few drops of water to avoid the burning of spices.
	Brown for 5 minutes	
2 lbs.	Potatoes, fresh	Wash, peel and cube the potatoes.
	Add	
2 lbs. 1 cup 1 medium	Cauliflower, fresh Water Green Pepper, fresh	Cut in cubes and wash the cauliflower. Chop the washed green pepper into small pieces. Cover the kettle and simmer on low heat for 15 minutes.
	Spread on Surface	
2 lbs. 10 oz.	Tomatoes, fresh Green Peas, frozen	Wash and slice the tomatoes. Cook on low heat for 10 minutes or until the peas are tender.

Estimated Time: 1 hour

Estimated Yield: 4 quarts (25-2/3 cup servings)

Revised Recipe

Firni - Rice Pudding

Amount	Ingredient	Method
3 qts.	Milk, whole	In a heavy bottom 6-quart kettle boil milk for 20 minutes.
	Add	
1 cup	Rice	Soak rice for an hour in 1 cup of water, grind, and mix in the boiling milk. Keep stirring for 15 minutes.
	Add	
3 cups 1 Tbsp.	Sugar, granulated Cardamon Powder	Continue stirring for 10 minutes. Mix well and remove from heat. Chill and serve with sliced almonds.
	Sprinkle	
½ cup	Almonds, sliced	

Estimated Time: 1 hour

Estimated Yield: 3 quarts (25-½ cup servings)

APPENDIX E

TABLE A

PANEL RATINGS - KURMA, EXPERIMENTAL RECIPE

Panel Members	Color	Texture	Consist-ency	Flavor	Accept-ability	Total
1	9	7	8	9	8	41
2	7	7	5	5	5	29
3	6	7	7	6	7	33
4	8	7	6	7	7	35
5	9	8	8	9	9	43
6	6	7	4	5	6	28
7	7	6	5	8	7	33
8	7	7	8	6	6	34
9	9	7	9	9	9	43
Average Score	7.55	7.0	6.66	7.11	7.11	35.44

TABLE B

PANEL RATING - KURMA, REVISED RECIPE

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Total
1	7	7	8	8	8	38
2	8	8	8	8	8	40
3	9	9	9	8	9	44
4	7	7	7	7	7	35
5	7	8	8	8	9	40
6	8	8	8	8	8	40
7	8	7	8	7	7	37
8	7	7	8	8	7	37
9	6	6	7	8	9	36
Average Score	7.44	7.44	7.88	7.77	8.0	35.22

TABLE C

PANEL RATING - KURMA, STANDARDIZED RECIPE

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Total
1	9	9	9	9	8	44
2	8	8	8	8	8	40
3	9	9	9	8	9	44
4	7	7	6	8	7	35
5	7	8	8	8	8	39
6	8	9	8	9	8	42
7	7	8	8	7	8	38
8	8	8	8	8	9	41
9	9	8	7	9	9	42
Average Score	8.0	8.22	7.88	8.22	8.22	40.55

TABLE D

PANEL RATING - VEGETABLE CURRY, EXPERIMENTAL RECIPE

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Total
1	5	4	7	5	6	27
2	5	6	6	8	8	33
3	8	8	7	7	7	37
4	7	7	7	7	7	35
5	5	7	7	7	5	31
6	4	6	5	6	6	27
7	3	3	5	4	5	20
8	5	6	5	5	6	27
9	4	5	6	6	6	27
Average Score	5.11	5.77	6.11	6.11	6.22	29.33

TABLE E

PANEL RATING - VEGETABLE CURRY, REVISED RECIPE

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Total
1	9	9	8	7	8	41
2	8	8	7	6	7	36
3	8	9	9	8	8	42
4	8	7	6	7	7	35
5	8	7	7	6	6	34
6	8	8	7	7	7	31
7	8	7	7	7	7	36
8	7	7	6	7	7	34
9	9	8	8	9	9	43
Average Score	8.11	7.77	7.22	7.11	7.33	36.88

TABLE F

PANEL RATING - VEGETABLE CURRY, STANDARDIZED RECIPE

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Total
1	8	8	8	8	8	40
2	9	8	8	8	8	41
3	9	9	8	9	9	44
4	7	7	7	7	7	35
5	8	7	8	9	8	40
6	9	9	8	9	9	44
7	9	8	8	8	9	42
8	8	7	8	7	8	38
9	8	9	8	7	9	41
Average Score	8.33	8.0	7.77	8.0	8.33	40.55

TABLE G

PANEL RATING - FIRNI, EXPERIMENTAL RECIPE

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Total
1	7	6	7	7	7	34
2	8	5	6	4	5	28
3	9	8	9	9	9	44
4	8	8	8	8	8	40
5	7	5	6	7	6	31
6	9	7	8	9	8	41
7	6	7	8	6	7	34
8	8	8	8	8	9	41
9	7	8	8	5	7	35
Average Score	7.66	6.88	7.55	7.0	7.33	36.44

TABLE H

PANEL RATING - FIRNI, REVISED RECIPE

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Total
1	9	8	8	9	8	42
2	8	5	5	6	6	30
3	8	9	9	9	9	44
4	8	7	7	7	7	36
5	7	6	7	8	8	36
6	8	8	8	8	8	40
7	9	8	7	8	8	40
8	8	7	7	8	8	38
9	8	7	7	9	7	38
Average Score	8.11	7.22	7.22	8.0	7.66	38.22

TABLE I

PANEL RATING - FIRNI, STANDARDIZED RECIPE

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Total
1	8	9	9	9	9	44
2	8	8	8	8	8	40
3	9	9	9	9	9	45
4	7	7	7	7	7	35
5	8	8	8	9	8	41
6	9	9	9	9	9	45
7	9	9	8	8	9	43
8	8	8	8	8	9	41
9	8	7	8	9	8	40
Average Score	8.22	8.22	8.22	8.44	8.44	41.55

TABLE J

PANEL RATING - PURI, EXPERIMENTAL RECIPE

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Total
1	5	8	8	7	8	36
2	8	8	8	7	8	39
3	8	8	9	9	9	43
4	7	7	5	6	6	31
5	7	7	7	8	7	36
6	7	7	7	8	7	36
7	7	7	8	7	8	37
8	7	7	7	7	8	36
9	7	6	8	9	9	39
Average Score	7.0	7.22	7.44	7.55	7.77	37

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