SANITARY QUALITY AND ADULTERANTS IN SELECTED PROCESSED FOODS

By

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THESIS

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DEDICATED

TO

APPA AND AMMA

DECLARATION

I hereby declare that this thesis, entitled **"Sanitary quality and adulterants in selected processed foods"** is a bonafide record of research work done by me during the course of research and that this thesis has not previously formed the basis for the award to me of any degree diploma, associateship, fellowship or other similar title of any other University or society.

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CERTIFICATE

Certified that this thesis entitled "**Sanitary quality and adulterants in selected processed foods**" is a record of research work done independently by **Ms. Nimmy Thomas** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to her.

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INTRODUCTION

1. INTRODUCTION

Historically, a major concern of human societies has been the attainment of sufficient quantities of food to provide a healthy life to their citizens. Only after this, the energies were diverted to progress in other areas. After the start of green revolution and attainment of self sufficiency in food production, the need for food processing was realized.

Over the last few decades both developed and developing countries experienced many changes that have led to an increased demand for processed foods. Anvita et al. (1993) has reported that there is a considerable change in day to day life of an average Indian due to various reasons viz. urbanisation, increase in per capita income, changes in life style, increase in working women population, scarcity of household labours as well as technological developments. All these factors have lead to increased consumption of processed foods. Processed foods now represent over 50% of the diet of many developed countries (Sudhir Singh 1996).

Sarkar (1989) has stated that old and traditional way of life is undergoing transformation from simplicity to complexity, which resulted in bulging of demand, which has led to more consumer problems. While Sobti (1988) and Sundaram (1990) have remarked that increasing demand for food commodity and

inadequate food availability would lead to adulteration of food. Swaminathan (1974) had defined food adulteration as the process in which the quality of the product is reduced through the addition of cheaper substances or through the removal of vital elements. According to Rajalekshmi (1974) any food article is considered to be adulterated if its nature and quality are not upto the standard which it professes to have implicitly or explicitly. Devadas (1972) stated that the act of adulteration has assumed large proportion, posing a serious problem to health.

Inspite of sophistication and all round improvement in production, processing and packaging, more poisons seems to be entering our food chain now, than ever before. Sodium chloride was one of the first substances to be added to food as preservative but now the whole picture has changed and a number of chemicals, useful in preserving foods and increasing palatability are available in market. These man-made chemicals add nothing to the nutritive value of food but deteriorate our health. The Tamilnadu voluntary health association (1993) has expressed their true concern over the growing menace of increased use of chemicals. They have stated that the increased incidence of diseases like cancer only seems to underline the basic truth that if we add hormone to animal feed, give antibiotics to keep them healthy and for quick maturity; if we keep on adding pesticides to our crops and fertilizer to the suffering soil then definitely our health could be seriously jeopardized.

Food is also a vehicle for the consumption of a vast array of microorganisms, including many that are either pathogenic or produce toxic metabolites. These microorganisms may originate from the soil, water, air, animals, insects, processing and packaging equipments, or from humans involved in food processing and preparation. Illness may be associated with consumption of food containing microbial toxins. (Sudhir et al. 1996). Considering this, an attempt was made to study the sanitary aspects and adulterants present in selected processed foods.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

2.1 The current trend in food industries

Food is the basic necessity of human being for survival and health. Its production and processing have been the traditional occupations of the countrymen from time immemorial as is evident from ancient mythological and historical literatures and organised effort to boost production in pre - independence period was started by the Government in 1871 (Sharma 1995).

According to Singh and Shewpalackar (1989), in the newly emerging era, fast and convenience foods and other instant foods are becoming increasingly popular among Indian households and therefore there is a higher priority for the development of food processing industry.

Mathur (1993) pointed out that during the last one decade there was a substantial progress in the quality and quantity of the products produced by Indian food industry and that it was mainly due to indegenous developments in the field of food technology.

Sohrab (1995) reported that the processed food industry is an important segment of industries in India.

Bhattacharya (1980) stated that the quality and quantity of products, produced by Indian food industry had

increased to a greater extent and among them the baking industry is one of the largest organised food industries in India with a turn over of Rs.1200 crores. More than two and a half fold increase in bakery products during the last decade had been reported by Haridas Rao (1993). Gaur et al. (1993) concluded that the annual production of baked products in India is about two to six million tonnes with 1.85 million tonnes of bread, 0.5 million tonnes of biscuit and 0.18 million tonnes of other bakery items.

Wendy and David (1987) opined that hot bread shops and in-store bakeries have brought about a dramatic increase in the perceived standards of the bakery trade. According to Haridas Rao (1993) the popularity of the bakery products is due to their ready to eat nature and reasonable cost in different parts of the country.

A survey conducted in the district of Punjab by Puri and Sanghera (1987) revealed that a majority of the people surveyed consumed processed foods and among the processed foods jam, squash and juice were very popular.

Parent (1984) reported that among adolescents intake of confectionary is high. Anvita et al. (1993) has also reported that the frequent consumers of processed foods are children than the adults in the households.

Guiteman and Gorden (1982) opined that middle income families residing in urban areas are heavy users of processed food items.

Anon (1987) stated that the processed foods play a very important role in our lives today with more and more women going out of the house to work, the time and energy spent in cooking foods need to be decreased substantially and thus the dependence on processed foods has increased dramatically. These foods add variety which has further increased their use. Anvita et al. (1993) also, adds that good quality of these products has increased the number of consumers.

2.2 Quality of foods

Quality is defined by Sajilata et al. (1994) as the degree of excellence.

Quality as defined by Jacob (1979) is that which makes a thing what it is, nature, character, kind, property, status, grade of goodness and excellence; and the parameters of quality are the grades, standards, and specifications laid down by the Government or expert bodies constituted for this purpose.

Kamp (1986) has found in a study that branded food products play more important role in consumer decision processes than unbranded products.

Anon. (1989) stated that the quality of processed food is strictly controlled since most of them require a quality mark like the FPO, Agmark or ISI.

Sohrab (1993) opined that product certification reflects compliance with a specification and also the presence of good quality management system.

Sharma (1995) has stated that quality standards plays a vital role in co-ordinating the efforts for integrated speedy development of industry in general and it is equally true for food sector. The food standards are set up by the Government to safeguard the people from health hazards caused by food adulteration. Thus standards constitute the basis of assessment of purity of food stuffs, and if they does not confirm to the standards prescribed then the food is deemed to be adulterated (Anon 1989).

2.3 Adulteration in foods:

Food Adulteration has become a major problem faced by the world and as the population is growing, the need for food has also increased; the increasing demand and inadequate availability has lead to adulteration of food (Girija 1994). Malayala Manorama Year book published in 1994 has stated that a major problem of the world today is finding of safe and acceptable foods for an ever increasing population and it has also reported

that the population of India has grown from 685 million in 1981, to 844 million in 1991 recording an increase of 23.5 per cent during a decade and anually 850 million rupees is being spent towards domestic food expenditure.

Sobti (1988) and Sundaram (1990) have remarked that increasing demand for food commodity and inadequate food availability would lead to adulteration of food stuffs.

Owing to change of life style there is great demand for convenient, instant, heat and serve and ready-to-serve foods; but this food revolution would not have been possible without food additives and such situation encouraged adulteration of food articles to some extend as pointed out by Manay and Shadakshara Swamy (1987).

Giri (1987) revealed that in a survey conducted by the Ministry of Health, Government of India, 25 to 70 per cent of the foods consumed in the country were adulterated or contaminated.

Mathan (1987) opined that according to Government of Kerala, 13 per cent of the food articles were found to be adulterated.

According to Mishra (1991), food adulteration which stood at 33 per cent in 70's has risen to 44 per cent in 80's and it is still rising. More foods are also reported to be adulterated in newer ways.

According to Jacob (1979) food adulteration includes not only the intentional addition or substitution or abstraction of substances which adversely affect the nature, substance and quality of foods but also their incidental contamination during periods of growth, harvesting, storage, processing, transportation and distribution. Narasingha Rao (1990) has classified the substances which enter into foods intentionally or accidently as: pesticide residues, metal contaminants, solvent residues, microbial contaminants, intentional adulterants and adulteration by adding additives.

Jacob in 1979 has summarised the various contaminants which enter in food intentionally or otherwise, as: natural toxicants, added toxic ingredients, adventitious contaminants, toxic foods : additives, bacterial and fungal contaminants, mineral and metal contaminants, pests and pesticide residues and packaging hazards.

Swaminathan (1991) stated that prohibited substances are either added to foods or partly or wholly substituted into foods in some cases valuable substances or constituents are removed from the foods, which lowers the quality of the product, and this type of adulteration is intentional adulteration.

Jacob (1979) has quoted milk and its products, edible fats and oils, cereals and pulses, spices and contiments, sweets and sweetners, beverages and salted products as the intentionally adulterated products sold in India.

Sobti (1988) and Mishra (1991) have published lists of intentionally adulterated articles in India. Milk and its products atta, edible oils, cereals, condiments, pulses, coffee, tea, beverages, besan, curry powders, vinegar, ghee, asafoetida, clove and turmeric powder were found included in the list.

Khanna et al. (1987) revealed the details of a survey conducted by the Industrial Toxicology Research Centre at Lucknow. This compilation revealed milk and milk products as the most adulterated foods accounting to the tune of 14-17 per cent while pulses were found to be the least adulterated (9.5 per cent). They also reported an exceptional increase in the magnitude of adulterants in vanaspathi from 2.6 per cent to 31 per cent.

A survey conducted in Delhi as reported by Diaz (1987) revealed that out of the 26 to 30 per cent of adulterated foods sold in the market 50 per cent of the spices, 20 per cent of oil, 15 per cent of sugar and 5 per cent of food grains were adulterated.

The survey Conducted by the Consumer Guidance Society of India (1987) in collaboration with the Bombay Municipal Co-operations health department and analysis centres revealed that 47.4 per cent of groundnut oil and 1 per cent of chilly powder were adulterated. The other commonly adulterated food articles reported were besan, cereals, coffee, butter, suji and soft beverages.

As per a project report on "Hazards of food adulteration in Trivandrum district", Prema (1989) found that, 90 per cent of milk, 90 per cent of dhal, 78 per cent of rice, 72 per cent of masala powder, 67 per cent of ghee, 25 per cent of asofoetida and 6 per cent of oil were adulterated among the samples collected from Trivandrum city of Kerala.

Philip (1988) reported that curry powder is one of the most important item which is adulterated to a greater extend than other contiments. Saw dust, charcoal powder and colourants are usually added intentionally to this and such adulterants are reported to produce disturbance in stomach.

According to Archer (1991) rice is usually added as an adulterant to white pepper. Ferwick in (1983) and Seidemann in (1993) opined that is usually adulterated with papaya seeds and that papaya seeds can be differenciated from pepper by the thick cell walls of seed husks; its star shaped cross section and the relative number of oil containing cells.

Oleimann et al. (1983) found adulteration of skim milk powder with rennet whey. Harding (1991) and Lidong (1992) reported that water is usually added to milk, which is the most common adulterant in milk but Ju et al. (1991) stated that milk is usually adulterated by adding reconstituted milk. According to Colluomb et al. (1992) low fat content of dairy products is usually noticed and it is a form of adulteration.

Gayathri (1988) is of the opinion that oils are usually adulterated intentionally Girimaji (1988) reported that ITRC at Lucknow had found argemone oil to be the most dangerous adulterant in oils which had caused mass paralysis in Behela district of West Bengal. Sajid Hussain et al. (1989) has reported the presence of foreign oil as an adulterant in coconut oil. According to Gupta (1993) most of the cooking oil from the market were found to contain upto one per cent argemone oil as major adulterant. Salivaras and Mc Curdy (1993) reported that olive oil is usually adulterated by adding other cheap oils.

Kulkarni (1990) reported adulteration of Basmati rice with improved Sabarmathi Pusa 169 PR 106 Kalilakra and Parimal. A minimum value of length/breadth ratio of 3.92 ± 0.09 to 4.09 ± 0.09) was found to be indicative of pure basmati.

Lipp et al. (1991) and Brookes et al. (1992) had remarked that adulterations of honey is another most important form of adulteration seen in India. They found that honey is being adulterated with fructose.

Tawfick (1981) through his study revealed that apple juice is usually adulterated with addition of other sugar solution or pear juice. Milburn et al. (1988) and Potter and Mensel (1992) identified adulteration of orange juice by addition of sugar beet and invert sugar. Wald and Gallensa (1990) identified the adulteration of pear juice with apple and apple

juice with pear which can be detected by HPLC with respect to their quality and quantity. Prysbyla (1991) stated that the most common form of adulteration in fruit juice is addition of other sugars other than cane sugar. Guraya and Toledo (1993) reported gelatinised starch in dry starch.

Melvin et al. (1989) pointed out that orange juice is usually adulterated to a greater extent than other fruit juices and that orange peel flavour sugar and acid have been mixed and coloured in a manner whereby inferiority of the produces is usually concealed. Yellow coal-tar dyes are also found in orange juice. Philip et al. (1989) has reported the practice of adulterating california orange juice concentrates with externally added carotenoids.

Fox and Cameron (1985) stated that addition of food additives, in larger amounts or without declaration, is a common practice. Nutrition researches conducted all over the world have shown that food additives used in processed foods have harmful effects on both physical and mental health and that children are found to be the most affected, being more vulnerable than adults (Chaur 1988). Gayathri (1988) opined that the adulteration of food with additives has its orgin in antiquity.

Sinha (1988), after scanning the different volumes of Food Adulteration Journal published during the years from 1984 to 1986 reported that 64 per cent of the reported cases of food

adulteration were due to addition of non-permitted food colours, and 36 per cent of the cases were in respect of illegal use of Saccharin in icecandy and beverages. Sampathu et al. (1981) and Arya (1987) pointed out that one of the major problems in our country is the use of highly toxic, non permitted dyes as food dyes, owing to ignorance and non availability of standard dyes.

Girimaji (1987) revealed that in comparison with children in USA, who grow on noodles, ice cream and chocholates, consume probably more dangerous non permitted colours than their counterparts in India, and it has been predicted that about four million children might consume more than one pound of coal tar dye through their food by the time they become twelve years old.

Rajan (1987) revealed the findings of the Technology Research Centre in which out of 12,575 samples of food stuffs analysed 8,820 were found to be adulterated with food colours, which were banned by government.

Khanna et al. (1986) reported that synthetic colourants are used in milk and non milk products, sugar and confectionary and it is one of the most important forms of adulteration.

Chengappa and Chindanand (1989) in their study conducted in Utter Pradesh, found that every third sample of colourful sweets, such as jelabi, burfees and toffees contained

prohibited dyes. While in a report published in the "Journal of consumer confrontation" during the year 1990, it has been stated that traditional colourants have been replaced by cheaper and harmful one.

Crivaro and Feberro (1992) reported the presence of Food Yellow FCF (F110) in fruit juices and juice based soft drinks.

Abdussalam and Kaferstein (1993) stated that in some cases, hazardous chemicals, and additives, notably unauthorized colourants and preservatives have been found in street foods. This may happen in connection with the practice of adulteration and falsification, which is widespread in some developing countries.

Biswas et al. (1994) reported that the quantity of colouring matter in jam, jelly and sweets were found to be in the range of 18-220 ppm which is far above the prescribed level of 0.2 grams of dye per kilogram of final food or beverage.

Apart from adulteration by addition of prohibited substances or removal of valuable substances from food contamination of food by pesticide residues would lead to many health hazards.

In India it is forbidden by law to mix any pesticide directly into food stuffs (Jacob 1979), but this practice is

still continuing which has led to many environmental hazards and that in turn has affected the wild, marine and human life (Chorlton, 1987).

Bhavani and Sen (1992) stated that varying levels of pesticide residues are found in agricultural commodities, foods, livestocks and poultry feed, soil and water. Pesticide also enter human system through egg, milk, meat through use of contaminated feed and fodder.

Chengappa and Chindanand (1989) are of the opinion that Indians are daily eating food laced with highest amount of toxic pesticide residues. The intake was 20 times more than what average Americans or English consumed with their food, and it equalled the world health organisation's danger level, for daily intake of these pesticides. According to Babu (1981) the level of accumulated DDT in the body tissue of an average Indian is highest in the world viz. 0.27 mg.

As reported in the Express News service (1987) by the Central Plant Protection Training Institute (CPPTI). Out of various food stuffs screened, 48 per cent had detectable residues of insecticides which was beyond the tolerance level. When 630 samples from different states were analysed by CPPTI during 1986-87, 151 samples were found to be substandard.

The data from India as a whole show considerable variations in DDT contamination of butter, which is expected, in

view of marked difference in the pattern of pesticide, in view of marked difference in the pattern of pesticide usage in different parts of the country.

Kalra and Armbruster (1987) stated that ghee is excessively contaminated with DDT and HCH in India and that all five ghee samples collected from Ludhiana were found to be contaminated with DDT above the Maximum Residual Limit (MRL).

Visalakshi et al. (1991) reported organo chlorine residue in bovine milk collected from 23 panchayaths of Thiruvananthapuram district of Kerala. Similar results on the presence of organo chlorine insecticide in milk and milk powder in Kerala has been reported by Naseema et al. (1991).

Handa (1992) in his study on pesticide residues reported that 86.5 percentage of 487 samples of milk tested were contaminated with DDT and 43.2 percentage had DDT-R and all samples contained the pesticide residue beyond the MRL of 0.05 on whole milk basis.

Jacob (1979) stated that metals are toxic when present beyond small concentrations.(WHO 1987) reported that there are atleast twenty metals which have been found to give rise to well recognised toxic effects in man and environment. They include antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, manganease, mercury, molybdenum, nickel and tin.

Sudhir et al. (1996) stated that the rapid industrialization and use of various metals for a variety of purpose have led to release of significant quantities of metal in our environment. He also added that lead is one of the most prevalent contaminants in food products and the major source of lead contamination is air. Air borne lead may contaminate dust which may then blow into foods and crops (Kacew and Singhal 1980).

Kapur and Nagaraja (1987) opined that processed foods are contaminated with lead, which leads to out break of food poisoning. Mahadeviah (1990) reported that vegetables, fruits, meat, fish, dairy products and marine products are contaminated with tin.

Venkataraman and Anandavalli (1995) reported that surface water samples collected from five different stations of Tuticorin coast contained heavy metals such as Cu, Zn, Pb, Mn, Fe, Cd, Cr and As.

While Abdul in 1995 found mercury accumulation in different tissues of Prawn Penaeus semisulcatus (De Haen) Lobster Panulerus homorus (Linnaceus) and fish Lethrinus nebulosus (Forskul). He also added that prawn accumulated more mercury than lobster and fish. Sudhir et al. (1996) reported that milk of buffaloes and cows of the villages near the rivers had high concentration of mercury.

Contamination of foods with toxic metals and pesticide has led to many health hazards. Food adulteration by additives have also infected the health of the people. Girija (1994) has also stated that food adulteration has of late, become a global phenomenon involving economic loss and health hazards to the consumer in a developing country like India.

2.4 Hazards of Food Adulteration

In spite of legislative measures and favourable judicial response against adulteration, the crime of adulteration is on the increase. Repeated surveys also corroborate the fact that food adulteration is rampant (Girija 1994).

Devadas (1972) points out that act of adulteration has assumed large proportions, posing a serious problem to national health.

Leelakrishnan (1983) reported that according to a survey conducted by the consumer council of India, as many as 774 and 1,063 death took place in the years 1973 and 1983 respectively owing to the adulteration of food articles.

Girimaji (1988) reported that ITRC at Lucknow had found argenine oil to be the most common and most dangerous adulterant and that paralysis had occurred in Behela District in West Bengal in 1988 due to adulteration of oil.

Philip and Raheena (1989) reported that disturbance of stomach, ulcer and cancer may be produced due to higher consumption of adulterated contiments.

Beegum (1988) stated that Saccharin, dulcin and many other sweetness, which are added to foods like sweets squashes syrups and jam are co-carcinogenic which in turn produce cancer. Raman (1989) opined that jelabi, halwa, ledu and barfee in which artificial colourants are used may cause cancer. As reported by the committee for Ecology of Food and Nutrition (1980), saccharin increased the incidence of bladder tumers in male rats.

Babu and Indushekar (1990) reported that some foods contain non-permitted colours used for dying goods, that are toxic to human and those which are reported, caused cancer in experimental animals.

Consumption of food containing pesticide residue results in several health problems. Gayathri (1988) reported that pesticide residue beyond the MRL limit gives rise to many health problems.

Philip (1989) reported that constant contact with chemical insecticides may cause nausea, vomiting, unconsciousness, cancer and even death. Chattopadhayay (1991) reported that pesticide contamination results in the formation of carcinogenic growth causing damage to the genetic make up of

somatic cells. He also added that other types of injury namely dermatitis asthma, utricaria and eczema, may arise due to pesticide contami-nation. Iyer (1992) stated that digestive disturbance and loss of appetite as early symptoms of insecticide poisoning.

Swaminathan (1991) reported that health hazards are caused due to metal poisoning. While Iyer et al. (1992) stated that loss of appetite an early symptom in the development pesticide poisoning. Kapur and Nagaraja (1987) opined that processed foods contaminated with lead leads to outbreak of poisoning.

Mahadeviah and Rowramma (1987) reported the occurance of digestive and neurological symptoms due to metal poisoning. Gayathri (1988) has reported that contamination of foods with copper causes dirrhoea, abdominal pain and vomiting.

Food adulteration includes the intentional addition or substitution or abstraction of substances which adversely affects the nature substance quality of foods which has led to consumer problems. Incidental contamination may also be caused by poor methods of cultivation, harvesting processing, transportation, storage, distribution and preparation (Gayathri, 1988). Bacteria and fungi are common contaminants of food. This has a direct and immediate impact on public health. In India 40 per cent of the population still live below the poverty line and they are not

even aware of the need of food hygiene and sanitation. Sharma (1995) stated that hygiene is a very important aspect for preparing and processing safe and sound food items.

According to Prevention of Food Adulteration Act of 1954 (PFA), an article shall be deemed to be adulterated, if the article has been prepared, packed or kept under insanitary condition whereby it has become contaminated or injurious to health.

Anon (1990) claimed that cut fruits, fruit salads and fruit juices which are sold in many cities in India are not generally kept clean and therefore may be a potential health hazard to the consumer eventhough BIS has laid down a code of hygiene (IS 8123:1976) for the stalls which sell such products.

Achaya (1993) stressed that many Indian sweet stalls are of sub-standard, unhygienic and are of poor microbial quality and their shelf life is also very poor.

Sankar (1995) reported the incidence of food poisoning in India due to the contamination of dairy products with streptcoccus faecalis, Bacillus cereus, Pseudomonas aeruginosa and Proteus sp. Rhodehamel et al. (1986) from their study stated that two common food borne pathogens, Staphylococcus aureus S-6 and enterocolitica were found as contaminants in whole cows, soy and winged bean milk. Battarchargee (1989) opined that the

major pathogens contaminating the food due to poor sanitary quality are fungi and bacteria.

According to Bharath Bushan et al. (1994) counts of mesophilic aerobes, coliforms, aerobic spore formers and staphylococcus in market samples of ice cream varied in relation to sources of packages. Higher counts of coliforms were reported to be prevalent in samples collected from local vendors. Ice cream samples from parlours and hotels, showed higher staphylococcus counts. With reference to packages, ice cream sold in cups had higher counts of coliforms· and staphylococcus while aerobic spore formers were in larger number in ice cream bars.

James (1986) reported that Monilia, Aspergellus, Mucor, Rhizopus, Penicillium sporotrichus are common contaminants found in bakery items.

Grifort and Lucina in 1987 reported the results of bacteriological analysis of icecream and surbet samples taken at point of sale and projected the presence of total bacterial counts, faecal coliforms and staphylococcus counts beyond the permissible limits.

After examining 25 market samples of rasmalai, Grewal and Tiwari (1990) found the presence of staphylococeus, E coli, Pseudomonas and Enterobacter in them.Goyle and Dugar (1993) found that three canteen snacks viz. samosa, dhal-ki-kachori and bread pakoda were contaminated with Staphylococcus group of bacteria.

Bacillus species and micrococcus species of bacteria were the contaminants of Prawn pickle which was stored at ambient temperature of (30 ± 2°C) as observed by Jawahar and Jayachandran (1994).

Riji Hari (1995) in her study revealed the presence of bacillus species of bacteria, Aspergillus species of fungi and yeast as common contaminants in pineapple products.

Sajilata et al. (1994) reported that Aflatoxin was the major contaminant found in ground nut sweets, spiced and sweet samples. The samples were contaminated with 2-150 ppbaflatoxin B1 which is beyond the permissible level of 30 ppb.

A vast array of microorganisms including bacteria and fungi enter into foods and produce toxic metabolites. These microorganisms enter into food through soil, water, air, animals, insects, processing and packaging equipments or from humans involved in food processing and preparation and consumption of infected foods lead to many illness (Murray, 1993).

Ananthanarayan (1991) reported that food may be infected prior to cooking. Joshua (1988) stated that food may be contaminated through water soil, air, equipment, carriers who handle the food and through flies and insects.

Jonnes (1988) reported that the annual incidence of food poisoning in Britan has increased by about 50 per cent

between 1982-87. While Hooker (1988) stated that Salmonella can be easily transmitted from uncooked meats to cooked foods when chopping boards and knives are not kept seperate or when cooked and uncooked meats are stored carelessly.

Murray (1993) added that a substantial proportion of these notified case is due to Salmonella infection.

Farber et al. (1988), Stern and Kazmi (1989), Doyle and Padya (1989), Doyle (1991), Bradshaw et al. (1991), Ganesh Kumar and Singh (1994) stated that improper or insufficient processing and post processing contamination are responsible for several food poisoning out breaks associated with various dairy products.

Frazier (1967) reported that when untreated domestic sewage is used to fertilize plant crops there is the likelihood that raw plant food may be contaminated with human pathogens especially causing gastro intestinal diseases.

The International Commission on Microbiological specification for food (1950) has reported the outbreaks of food borne diseases like diarrhoea, vomitting, nausea and abdominal cramps. The incidence was contributed by infected Kitchen staff.

Smith (1972) opined that unclean hands, body odours, infectious sores and diseases are the main source of

contamination of food which is transferred through persons who handle it.

Food is frequently subjected to chemical and biological contamination in a number of ways, and this has a direct extensive and important bearing on public health. People need to be protected against the sale of adulterated foods, foods of inferior quality and false advertising. Some of these problems need Govenmental help, others need individual understanding and vigilance Raheena Beegum (1991) Girija (1994) reports that lack of awareness about food and food related matters has highly influenced the incidence of food adulteration and consumer education has to be evolved as a definite programme of government action for checking out food adulteration.

2.5 Need for awareness

Food adulteration is a menace which can sap the vitality of our people (Gupta 1988). Devadas (1972) pointed out that the act of adulteration has assumed large proportion posing a serious problem to national health.

Anon (1991) stated that in the present day consumers are being exploited and they are not aware of this; but it could be achieved through consumer awareness programmes.

As stated by Neelakanta (1989) probably consumers are always in the dark, unable to understand the various hazards

resulting from ignorance. Thomas (1970) is of the opinion that lack of correct information also worsens the situation. Sundaram and Salini (1990) feels that ignorance and indifference among the educated consumers have made legal provisions ineffective and sometimes Poverty joes with ignorance and this situation adversely effects consumer interests.

According to Dixit (1989), the cool and negative attitude of the consumers gives greater opportunity for unscrupulous traders to fleece consumers mercilessly, since the consumers are taken for granted as they have no choice and no voice regarding selection, and because they seldom try for redress of grievances. Thus, the consumer groups in the dark for mere survival in a world of cheats and marauders. Sastry (1987) opined that consumers are confronted with a bewildering variety of products of like appearance, and are often misled by deceptive publicity or propaganda on the part of the manufacturers. Kotia and Sharma (1986) has opined that consumer also contribute to food adulteration situation because of their propensity to going in for the cheapest food stuffs.

Jayalekshmi (1991) claimed that in the developed countries, the consumers are well educated, informed and are more sophisticated about their choices and selection of goods and services according to their requirements, because the supply is in abundance often exceeding the demand. But in developing

countries like India the consumers are poor, uneducated and ignorant of quality and packaging.

Diaz (1987) claimed that lack of public awareness makes malpractices easy for the corrupt and inefficient sections of the enforcement machinary. This situation is worsened by negligence indiscriptive and unfair practices at many levels.

According to Corkish (1988) consumer education is pursued vigorously in Scotland both informally through the broadcast media and formally through the channels of education. Whelan (1989) stated that in New Zealand the health department is fully responsible for ensuring that the food on sale is fit for human consumption and the consumers are given full information on food items.

While Turner in 1987 reported that the Government of U.K. always took rational steps to prevent adulteration and the manufacturers would suffer greatly if products were suspected to be unsafe.

According to Narayanaswamy (1990) in a developing country like India there is a lack of awareness among the people about the impacts of food adulteration and this menace is still continuing. In developed countries, due to the implementation of food laws for the last few decades, there has been a significant improvement in the quality of food. In India also, as early as in

1860, adulteration of food was dealt with in certain sections of the Indian penal code (Sec: 272, 273). Later it was included under the provisions of the Municipal Act (Beegum 1991). However in the legal provisions against this social crime hardly succeeded in remedying this evil which cannot be delected and penalised at one spot.

2.6 Role of Government/non Government agencies in preventing food adulteration

Jacob (1979) opined that it is very difficult, in some cases, to find the type of adulteration, hence it is difficult to take precautions against it. But the prevention of Food Adulteration Act and PFA rules are designed to eradicate the manace of food adulteration and to ensure the purity of food articles.

Sharma (1995) stated tht efforts to regulate the food quality have been going on in India right from 1899, when some provinces had made rules for this purpose Central Food Advisory Board established in 1937 and the Food Adulteration Committee set up in 1943 after reviewing the subject, suggested enactment of central legislation for bringing out uniformity in food quality laws and making it mandatory in the country. This resulted in enactment of prevention of Food Adulteration Act, 1954.

Sen Gupta (1988), opined that standards prescribed under PFA act, 1954 are the minimum standards and are mandatory;

violation of PFA rules 1955 and non confirming to the standards prescribed is punishable by law.

The PFA (Central Act 37 of 1954) has been implemented throughout Kerala Since 1957 (Girija 1994).

The news letter published by "Agmark" Government of India in 1990 reported that Agmark prevents and protects the consumer from the purchase of uncertified and adulterated products, the consumption of which is likely to cause health hazards.

Srinivasan and Veena (1982) stated that consumer awareness has however been steadily growing, thanks to the activities of consumer guidance organizations and the general expansion in women's education. Krishnaswamy (1987) has opined that the consumer protection counsil which has already become a powerful body ensuring protection of consumer interests, can do a lot in this direction.

Manay and Shadaksharaswamy (1987) opined that, unfortunately in our country there are still no strong consumer associations to give proper education to the public at large about the various methods of adulteration and ways to detect it. But, in western countries there is a rising concern over the safety of the food supply and many remedial actions, both voluntary and enforced are being taken.

Girija (1994) stated that in India, there are legal provisions against, this social crime viz food adulteration but they hardly suceeded in remedying this evil which cannot be detected and penalised at one spot.

MATERIALS AND METHODS

3. MATERIALS AND METHODS

A study entitled "Sanitary quality and adulterants in selected processed foods" was undertaken inorder to identify the contaminants and adulterants found in most commonly consumed processed foods through chemical and microbiological evaluation.

The plan of study

The study consisted of the following:-

3.1 A survey among selected households, to find out the extent of use of processed foods among selected households in Trivandrum city.

3.2 A survey among selected shops to find out the availability and extent of sale of processed foods in selected areas of Trivandrum city.

3.3 Analysis to identify the contaminants in most commonly used processed foods through suitable microbial tests.

3.4 Analysis of the composition of selected processed foods through chemical analysis, to identify adulterants if any.

3.1 A survey among selected households to find out the extent of use of processed foods among selected households in Trivandrum city

The study was conducted in Trivandrum city, since several studies have identified that the use of processed foods

as well as the extent of adulteration are more in urban areas, especially the cities. Access to the area from the institution, from where the study is conducted was also taken into consideration while selecting the location.

Simple random sampling was done to select hundred respondents, to study the extent of use of processed foods in selected households. The criteria for selection of respondents was fixed such that only middle income families were selected for the study, inorder to avoid the variations in the purchasing power (of the higher and lower economic groups) of families which may affect their purchase habits and behaviour. This sampling technique was employed to achieve higher level of accuracy since complete coverage of the population is not feasible (Maria 1989) under the existing contingencies of the study.

A schedule was prepared for assessing the extent of use of processed foods among selected households. The schedule included socio-economic profile of the respondents, the frequency and extend of use of processed foods and the knowledge of the respondents on sanitary quality and the presence of adulterants in processed foods. The schedule was pretested and appropriate modifications were incorporated and was employed for the survey. The schedule is given in Appendix I.

The survey was conducted using the above schedule by interview method, visiting each of the respondents. Bass et al.

(1979) reported that interview method is most suitable, since it proceeds systematically and helps to record the collected information quickly. As suggested by Charles and Kahn (1968) during the interview the investigator presented each topic by means of specific questions and takes care to continue the dialogue until sufficient information was gathered to satisfy the research objectives.

3.2 A survey among selected shops to find out the availability and extent of sale of processed foods from selected areas of Trivandrum city

This part of the study was conducted in 15 selected areas of Trivandrum city. The areas selected for study included East Fort, Ulloor, Medical College, Sasthamangalam, Peroorkada, Statue, Thampanoor, Pettah, Pattor, Sreekariyam, Vazhuthacadu, Overbridge, Bakery Junction, Palayam and Kesavadasapuram. These areas were selected as maximum number of shops selling processed foods were found to be located in these areas on a pre-survey visit under-taken on the basis of the area map of Trivandrum city.

A total number of hundred shops were selected encompassing the selected areas by purposive/judgement random sampling technique.

Accordingly the number of shops selected from each area are presented in Table 1.

Table 1 Area and number of shop selected for study

Area of study	Total number of shops selected from each area
East Fort	12
Ulloor	8
Medical College	9
Sasthamangalam	5
Peroorkada	12
Statue	6
Thampanoor	7
Pettah	4
Pattor	6
Sreekariyam	4
Vazhuthacadu	6
Overbridge	7
Bakery Junction	4
Palayam	5
Kesavadasapuram	5
Total	100

This survey was conducted by interviewing the shop keepers. Informations on the items available for sale, and the extend of sale of each item on a daily basis were collected through personal dialogue and recording the relevant data in a format designed for the purpose.

From the two independent surveys conducted as detailed above the most common processed food items purchased and consumed by the selected households, as well as those sold from the shops of different parts of the city were identified. Packed and labelled factory products and items which had 'quality marks' were excluded since they might have been subjected to quality testing before release into the market as per the P.F.A. rules. Thus items like milk powder, pickle, jam, health drinks, infant foods, noodles and squash were excluded for detailed analysis even though they are sold/consumed at higher rates.

Thus the most commonly used items identified through the survey were cake, biscuits, bread, fried items (banana chips), sweets (jelabi, laddu and groundnut sweets) puffs, cutlet, ice cream and milk.

Apart from this, carbonated beverages (soda) was also added to this list because this was an item sold in large number from petty shops and consumed by the public though it was not mentioned either by shop keepers or by house holders, but located during the frequent visits to the market area by the investigator.

3.3 Analysis to identify the contaminants in processed foods through suitable microbial tests

Out of the 12 items identified as most commonly consumed and sold processed foods through the surveys, items such

as ice cream, groundnut sweets, fruits drinks fruit juice, soda and milk were selected and subjected to microbiological evaluation. The other items except milk were excluded from microbial evaluation since, they were found to be subjected to processing under high temperature, which is liable to reduce the microbial load. Even though pasteurised milk has undergone high temperature processing, it was also taken for microbial examination because it is the most frequently purchased and used processed item of the city dwellers and also because ISI has specified certain quality standards for it. The tests and methods used for microbial evaluation are detailed below.

3.3.1 Microbial analysis of milk samples

Milk samples were subjected to microbial analysis to find the total bacterial count and the presence of coliforms as specified by IS. 13688, 1992 (ISI 1992). Total bacterial count of milk samples were found using seriel dilution plate technique using peptone - glucose - extract agar medium. Presumptive test was also carried out to find the presence of coliforms. The procedure explained by Collins and Patricia (1976) was followed to find out the total bacterial count and to identify the presence of coliforms in milk. The composition of the media used for the analysis is given in Appendix II (1 and 2).

3.3.2 Microbial analysis of fruit drinks and fruit juice samples

Fruit drinks and fruit juice samples were subjected to microbial analysis to find total bacterial count and coliforms in them. Total bacterial count of fruit drinks and fruit juices were carried out by simple streaking method on Nutrient agar medium. Presence of coliforms was detected using presumptive test. The procedure prescribed by Collins and Patricia (1976) was followed for the above tests. The composition of the media is given in Appendix II (2 and 3).

3.3.3 Microbial analysis of ice cream samples

ISI vide IS 2802 - 1964 has specified that the total colony count of bacteria per gram of ice cream should not be more than 250000 and that the sample should be free from coliforms (ISI : 1964). Accordingly ice cream samples were tested for the presence of coliforms through presumptive test. Total bacterial count of the samples were also done using seriel dilution plate techniques on peptone - glucose extract agar medium. Apart from this the ice - cream samples were tested for the presence of Staphylo coccus and Salmonella since several studies done in the country have revealed the presence of harmful microbes such as Salmonella and Staphylococcus in ice cream samples. Barath Bhushan et al. (1994) reported the presence of mesophilic aerobes, coliforms, aerobic spore formers and staphylococcus in market sample of ice cream. Grifort et al. (1987) also reported

the presence of faecal coliforms and staphylococcus in ice cream samples. This indicates poor sanitary quality of the material.

Presence of salmonella was estimated by streaking the sample on Mac-Conkey agar medium. Staphylococus medium and streaking technique was used to identify the presence of staphylococcus in icecreams and composition of the medium used for analysis are given in Appendix II (1, 2,4 and 5).

The total bacterial count and the test to identify the presence of coliforms were carried out according to the procedure prescribed by Collins and Patricia (1976). Test for the presence of salmonella and staphylococcus were carried out according to the procedure outlined in the Defco manual (1977).

3.3.4 Microbial analysis of soda

Microbial analysis of soda was carried out to find out whether the water used for the preparation of the carbonated beverage was free of faecal contamination since water is the major ingredient of soda. Accordingly presumptive test was carried out using the procedure prescribed by Collins and Patricia (1977). The composition of the media used is given in Appendix II (2).

3.3.5 Microbial analysis of groundnut sweets

ISI vide IS 7592: 1989 has specified that groundnut sweets should not contain staphylococcus, salmonella and

coliforms. ISI has also specified that total bacterial count per gram should not exceed 5000 and the count for yeast and mold should not exceed 10/gram (ISI 1989). Accordingly the samples were evaluated for their yeast and mold and bacterial count by seriel dilution plate technique in appropriate medium.

Staphylococcus medium was used for finding the presence of staphylococcus and Mac-Conkey agar medium was used for testing the presence of salmonella in groundnut sweet samples. Presumptive test was carried out to identify coliforms. Total bacterial count and the test to identify yeast and mold were carried out according to the procedure prescribed by Collins and Patricia (1976). The media used were Malt extract agar media and Rose bengal agar medium. Test for salmonella and Staphyloccus were carried out according to the procedure prescribed in the Defco manual (1977). The composition of the media are given in Appendix II (2, 3, 4, 5, 6 and 7).

3.4 Analysis of the composition of selected processed foods through chemical analysis, to identify adulterants (if any)

Out of the 12 most commonly consumed and sold processed foods, items such as bread, cake, biscuit, jelebi, laddu, icecream, milk, fruit drinks and groundnut sweets were subjected to chemical analysis to find the composition and adulterants present in them. The tests and methods used for chemical

analysis were the ones prescribed by the Indian Standard Institution and the details are described below.

3.4.1 Analysis of bread samples

As per the specifications of ISI (1989) bread samples were tested for their total solid content, pH, acid insoluble ash and crude fibre to find out its quality with respect to their composition. Analysis of the above were carried out as per the procedure specified by IS 1483-1988.

3.4.2 Analysis of cake samples

Cake samples were tested for moisture (per cent by mass), acid insoluble ash and acidity of extracted fat (per cent by mass) according to the procedure specified by IS 9712 : 1981 (ISI 1981).

3.4.3 Analysis of biscuit samples

According to ISI specification biscuit samples were tested for their moisture (per cent by mass), acid insoluble ash, and acidity of extracted fat (per cent by mass) and carried out as per the procedures specified by IS 1011 : 1992 (BIS 1992).

3.4.4 Analysis of Jelebi samples

Jelebi samples were tested for the presence of artificial colourants and sweetners as prescribed in SP 18 Part XI - 1981 (ISI 1981).

3.4.5 Analysis of laddu samples

Laddu samples were tested for the presence of artificial colourants and sweetners as per SP 18 Part XI - 1981 (ISI 1981).

3.4.6 Analysis of fruit drink samples

Fruit drink samples were tested for the presence of Bromulated vegetable oils (BVO), artificial sweetners and artificial colourants. Apart from this the total soluble solid content and acidity of the materials were also estimated according to ISI specification stated in SP 18 Part XI 1981 (ISI 1981).

3.4.7 Analysis of ice cream samples

Total solids content, milk fat content and sucrose content of the ice cream samples were estimated as per the stipulations specified in IS 2802-1964 (ISI 1983). Apart from the above tests the protein, total sugar, cane sugar content of the samples were analysed. Further presence of artificial sweetners and colourants were also tested in accordance with the stipulations and procedure prescribed by SP 18 Part XI 1981 (ISI 1981).

3.4.8 Analysis of milk samples

ISI vide 13688 1992 has specified the quality requirements of pasteurized milk. They have advocated that the

milk should be tested for its fat, and SNF (Solid-not-Fat) as per IS 1479 (part 2) 1961 and IS 12333 : 1988. Apart from this ISI has specified the tests for the presence of micro organisms also, as by IS 13688, 1988 (BIS 1992). Apart from the above ISI tests, specific gravity of the samples were also estimated to test whether the sample is adulterated with water. The tests were carried out according to the procedure specified by Chaudhary (1959).

3.4.9 Analysis of groundnut sweet samples

Chemical analysis of groundnut sweet samples were carried out to find the moisture, protein, fat, total sugar, sucrose and acid insoluble ash contents. Acid value of extracted fat was also found out. These tests were carried out according to the specification and procedures prescribed vide IS 7592 : 1989 (BIS 1989).

3.5 Statistical analysis employed

The collected data were processed and analysed using the statistical method : percentage analysis.

RESULTS AND DISCUSSION

4. RESULTS AND DISCUSSION

A study entitled "Sanitary quality and adulterants in selected processed foods" was undertaken inorder to identify the contaminants and adulterants found in most commonly consumed processed foods through chemical and microbial evaluation.

The study consisted of the following

4.1 A survey among selected households in Trivandrum city to find out the extend nature and of use of processed foods in Trivandrum city.

4.2 A survey among selected shops to find out the extend of sale and availability of processed foods in selected areas of Trivandrum city.

4.3 Analysis to identify the microbial contaminants in selected processed foods through suitable micro biological tests.

4.4 Analysis of the composition of selected processed foods for identification of adulterants

4.1 A survey among selected households, to find out the extend and nature of use of processed foods among selected households in Trivandrum city

A survey among selected 100 households in Trivandrum city to find out the extend of purchase and use of processed foods was conducted. The data collected were analysed and the results are presented under the following headings:-

4.1.1 Socio-economic pattern of the families surveyed.

4.1.2 Nature and extent of use of processed foods.

4.1.3 Knowledge of the respondents on the sanitary quality and presence of adulterants in processed foods.

4.1.1 Socio-economic pattern of the families surveyed

The socio-economic pattern of the hundred families, with particular reference to religion, type and size of the family, details about the family, economic status, sources of income and expenditure pattern were ascertained. The above socio-economic factors were taken into consideration inorder to find out the influence of these factors on the selection and use of processed foods by these families.

Table 2 shows the details pertaining to selected personal details of the respondents such as religion, type of family, marital status and employment status.

Table 2 Personal details of the respondents

Details	Distribution of the respondents in number/percentage
1. Religion	
Hindu	77
Muslim	4
Christian	19
Total	100
2. Type of family	
Joint	17
Nuclear	83
Total	100
3. Marital status	
Married	92
Unmarried	2
Widow	6
Total	100
4. Employment status	
Employed	
1. Full time	61
2. Part time	2
Unemployed	37
Total	100

(n = 100)

Residential area, is expected to have an influence on the purchasing habit of people in a community. The people

residing in urban area are believed to purchase more processed foods, as they have better access to markets selling processed foods. As all the respondents had the same area of origin, they are more attracted to processed foods, hence may purchase processed foods.

The employment status of the women has increased the demand for time and energy needed for household activities, especially cooking and thus the dependence on processed foods and other ready to eat food has increased dramatically. This finding is very much in line with the study of Anon (1993) where it was found that processed food play a very important role, in our lives today, with more and more women going out to work, the time and energy spent in cooking needs to be decreased and thus they have to depend on processed foods.

Religion wise classification of the respondents showed that seventy seven persons were Hindus; nineteen were Christian and four were Muslims.

Details pertaining to the type of family showed that 83 per cent of the respondents were from nuclear families. The result of this study is in line with those of George (1988), Nagammal (1989) and Thomas (1989) who reported that most of the families residing in rural/urban areas of Trivandrum district were of nuclear type. It may be observed that nuclear families

might purchase more processed foods than joint families, since they have more freedom as well as better per capita income.

Nuclear family consists of husband, wife and children. In most of the nuclear families of Trivandrum, both the spouses are usually employed and cannot spare much time for cooking. Hence they prefer the consumption of processed foods as it is more convenient and more time saving, whereas in case of joint families the number of family members are more and they have an added advantage of sharing the household work and less effort is required in the cooking. Another reason as pointed out by Chellammal (1995) was that processed foods may become popular in nuclear type families since the women will be involved in multifaceted activities within the house. Guitiman and Gorden (1982) opined that nuclear families residing in urban areas were heavy users of processed food items.

Out of the hundred families surveyed 58 per cent of the families had two to three members in their family, while 33 per cent had four to five members and nine per cent had more than six members. The small family size that is seen among the majority of respondents could be attributed to the elevated education level of the parents, since, Kerala state is well known for its literacy rate. Oza (1987) has stated that size of the family will be small for the couple having educated husbands. Mazumdar (1979) has opined that expansion of employment and

strengthening of women's decision making roles would also contribute to the adoption of small family norms.

Analysis of the marital status of the respondents showed that 92 of the respondents were married and two were unmarried; while six were widowed. Out of 100 home makers surveyed 63 per cent were employed. Employment status of the home makers is also expected to influence the consumption of processed foods in two ways. Primarily as the employment status increases the income also increases. Thus the money spent on processed food is also likely to increase. Secondly as employed respondents have a busy schedule, for them 'Time' become a very restricted resource. As they have little time for cooking they are sometime forced to depend on convenience foods. Hence the employment status was taken into consideration. Out of 100 home makers 37 per cent were unemployed. This is in par with the study of Anon (1987) who has stated that working women have little time and energy to spend in cooking foods, and they have to depend on processed foods to feed the family.

Newly weded couples will depend on processed foods than old couples, so number of years of marriage was also taken as a factor governing purchase of processed foods Table 3 shows the number of years of marriage of the respondents.

Table 3 Number of years of marriage

Number of years of marriage	Number/percentage
Less than 5 years	5
Between 5 - 10 years	18
More than ten years	77
Total	100

From the table it was indicated that 72 per cent of the homemakers were married for 10-20 years and about eight per cent have been married for about 5-10 years.

Apart from the details such as residential area, type of family, marital status, employment status, number of years of marriage, details pertaining to educational status of the family was also taken into consideration in this survey. Educational status of the family has a direct effect on the food selection due to exposure to printed media (Anvita et al. 1993). Educated people are more exposed to the mass media, and they know more about the different types of processed foods available in the market. There is more probability for the educated people to purchase the different types of processed food available in the market. Which may also be due to their employment and contact with the heterogeneous population outside the family and community circle which they would have acquired due to their

educational status. Table 4 shows the educational status of the respondents.

Table 4 Educational status of the respondents

Educational status	Number/percentage
Below 10^{th} standard	3
SSLC	30
Pre Degree	36
Degree	19
MSc./Professional	12
Total	100

Educational status of the families revealed that 30 per cent of them were matriculates; thirty six per cent had passed PDC and 19 per cent were degree holders.

Only a minority of 12 per cent of the total 100 families surveyed had masters degree or professional qualification. Thus it could be inferred that the respondents were all moderately educated.

Male-female ratio of the families was also taken into consideration. Table 5 shows the male-female ratio.

Table 5 Male-female ratio

Ratio	Number/percentage
1:1	55
1:2	39
1:3	6
Total	100

The results showed that there were an equal distribution of males and females among 55 per cent of the families with a ratio of 1:1. It was found that 45 per cent had more females than males, reflecting the general demographic sex profile of Kerala, Kerala has more females compared to males (Malayala Manorama 1995).

The money spent on food was found to be dependent on family income and the number of family members. As the money spent on food increases, the money spent on processed food will naturally increase hence the income and expenditure pattern was taken in to consideration. Table 6 shows the income and expenditure pattern of the families.

Table 6 Income/Expenditure pattern of the families.

Details of the respondents	Distribution in number/per cent
Income of the respondents	
Between 1000 - 2000	26
2001 - 3000	17
Above 3000	10
No income	37
Total	100
Family income	
Between 1000 - 2500	26
2501 - 4000	20
4001 - 5500	22
5501 - 7000	20
Above 7000	12
Total	100
Family expenditure	
Between 1000 - 2500	39
2501 - 4000	27
4001 - 5500	18
5501 - 7000	11
Above 7000	5
Total	100
Expenditure on food	
Between 500 - 2000	65
2001 - 3500	28
3501 - 5000	4
Above 5001	3
Total	100

Out of 100 respondents 63 respondents were employed. The monthly income of respondents showed that 26 per cent of the home makers had a monthly income between Rs.1000/- to Rs.2000/-

about 17 per cent had income between Rs.2001 to 3000 while 10 per cent had family income above Rs.3000/-. While 37 per cent of the respondents surveyed were not employed. This implied that education of home makers provided better job prospects, that increased family income, which supported the contention that dual career families are better off economically than single carrer families (Maria 1989).

Oza (1987) reported that education of the working mother as well as that of the head of the family increases the level of family income and the money spent on food will depent on the total family income.

The monthly income of the family showed that 26 per cent had a monthly income ranged from Rs.1000/- to Rs.2500/-; 20 per cent had an income between Rs.2501/- to Rs.4000/-; 22 per cent had an income ranged from Rs.4001/- to Rs.5500/- another 20 per cent had an income ranged from Rs.5501/- to 7000/- and only 12 per cent had an income above Rs.7000/-. It can be assumed that higher and regular is the income money spent on food, especially on processed foods increases. This is very much in line with the study of Mathias (1971) who found that with higher and regular income, the consumption pattern of the family changed in quantity and quality.

Total family expenditure showed that 39 per cent of the respondents spent between Rs.1000/- and Rs.2500/- per month,

while 27 per cent spend between Rs.2501/- and Rs.4000/-. Eleven per cent of the respondent had a monthly expenditure between Rs.5501/- and 7000/-. The remaining five per cent incurred above Rs.7000/- for family expense.

The expenditure pattern on food showed that 65 per cent of the respondent can afford to spend rupees Rs.500/- to Rs.2000/- on food, while 28 percentage had an expenditure of Rs.2001/- to Rs.3500/- and 4 per cent had an expenditure of Rs.3501/- to Rs.5000/- for purchase of food. A minority of 3 per cent paid above Rs.5001 on food. The expenditure on food may depent on family income and number of family members. Quiogue (1970) found that the lower the income, the higher was the percentage of income spent on food. Chellammal (1995) reported that expenditure on processed foods was also directly proportional to the total food expenditure.

Apart from the socio-economic profile of the respondents, details on various other factors, concerning, the help received from other members of the family in household activities and the availability of work simplification devices in household were also collected from the respondents. These factors were taken into account to study whether the respondents had time facilities to prepare processed foods for their families.

Table 7 shows, whether any of the members in the family, helps the respondents in doing the domestic chores. Out

of the hundred respondents, 70 per cent had some one to help in carrying out the daily activities of the household.

Table 7 Help for domestic work

Person who helps in domestic work	Number/percentage
Son	6
Daughter	33
Husband	26
Servant	26
Mother-in-law	5
Sister	2
Daughter-in-law	2

The table presented above indicates that 33 per cent of the respondents, were helped by their daughters. 26 per cent by their servant and 26 percent by their husbands in doing their household work. According to Soni et al. (1986) husbands in dual career families assume an important supportive role. It was seen that working wives received considerable help from their husbands than from other members of the family. About two to six per cent of the respondents reported that they were helped by their sons, sister, daughter-in-law or mother-in-law. This indicates that all the families have some one or other to help them in household activities. If a source of help can be considered as an incentive to prepare processed foods at home then, all the respondents can prepare such foods.

Another possible item that favours preparation of processed foods is suppossed to be the availability of work simplification and time saving devices. Table 8 shows whether the respondents possessed the different types of commonly available work simplification devices at home.

Table 8 Work simplification device

Device	Number/percentage
Mixie	78
Gas stove	78
Rice cooker	50
Bread toaster	12
Milk cooker	10
Soda maker	3
Electric oven	2
Hot case	2
Wet grinder	2
Microwave oven	2
Food processor	2
Cooking range	1
Solar cooker	0

Fifty per cent reported that they used rice cookers while twelve per cent had bread toasters also. Only ten per cent had milk cooker. Less than three per cent of the respondents

reported that they had items like soda maker, electric oven, hot case, wet grinder, micro wave oven, food processor and cooking range. Sundari and Kamalanathan (1968) reported a saving of one hour and 27 minutes of cooking time in the preparation of the reference meal by using selected labour saving kitchen devices. Therefore it is assumed that those who had labour saving devices in their kitchen might find more time and energy at their disposal to prepare processed foods.

4.1.2 Nature and extent of use of processed foods

Nature and extent of use of processed foods by the families of hundred respondents were assessed. Details pertaining to the expenditure on purchase of processed foods, the various processed foods used by the family members, sources of purchase, the extent of preparation of processed foods at home, the help derived from other members of family in preparing processed foods, interests and preferences exhibited by family members towards processed foods and also advantages and disadvantages of using processed foods were ascertained using a specially designed interview schedule. These details were taken into consideration to find the nature and extent of use of processed foods among the hundred families. These details also throws light on the details such as frequency of purchase of processed foods, awareness of the people on the sanitary quality and presence of adulterants in various processed foods, and the

variety of processed foods available in market. The details collected on these lines are presented as below.

The overall picture evolved from the study revealed that 95 of the 100 respondents surveyed were in the habit of purchasing processed foods from the market.

Table 9 shows the details pertaining to the money spent by the respondents for purchasing the processed foods.

Table 9 Expenditure on processed foods

Expenditure on processed foods (Rs.)	Distribution of respondents Number/percentage
Between 50 - 150	43
Between 151 - 300	29
Between 301 - 450	1
Above 451	22
Nil	5
Total	100

These figures show a higher consumption pattern of processed foods by the respondents surveyed. This may be attributed to various advantages of using processed foods over preparing these dishes at home. This finding is endorsed by the observations of Singh and Shewpalackar (1989) who stated that in

the newly emerging era of, fast and convenience foods instant foods are becoming increasingly popular among Indian households. More over as aptly reported by Anvita (1993) as various aspects like urbanisation, increase in percapita income, changing life style, increase in working women population, scarcity of household labours as well as technological development has changed the day to day life of average Indian there by increasing the consumption of processed foods.

It is understood that as the extent of purchase and use of processed food increases the expenditure of the household as well as the amount spend on food, and especially on purchase of processed food, also increases. Hence an attempt was made to study the expenditure pattern with reference to purchase of processed foods. Expenditure pattern showed that forty three families spend between fifty to one fifty rupees per month, for the purchase of processed foods. Twenty nine per cent were found to spend between one hundred and fifty and three hundred rupees and only one per cent were observed to spent between three hundred and four hundred and fifty rupees. Twenty two percentage of the respondents surveyed spent above four hundred and fifty rupees on an average in a month to purchase processed foods, while only five per cent did not spent, money on processed foods. Details pertaining to the purchase and use of processed foods were also ascertained. This was done to find the frequency of purchase, place of purchase, frequency of use of the most

commonly purchased and used processed foods and the details are given in Table 10.

Table 10 Data pertaining the purchase and frequency of use of processed foods

Items	No.of respondents who purchased the item	Place of purchase			Frequency of purchase								
					Daily			Weekly			Monthly		
		Bakery	Super market	Petty shop	1	2	3	1	2	3	1	2	3
Cake	64	64	-	-	1	-	-	56	2	-	5	-	-
Fried items	51	49	2	-	-	-	-	46	2	-	1	-	-
Bread/Bun	70	70	-	-	-	-	-	67	3	-	-	-	-
Sweets	49	47	1	1	1	-	-	46	2	-	-	-	-
Toffee	17	14	0	3	-	-	-	16	-	-	1	-	-
Jam	40	39	1	-	-	-	-	40	-	-	-	-	-
Pickle	29	36	3	-	1	-	-	20	8	-	-	-	-
Baby foods	11	11	-	-	10	-	1	-	-	-	-	-	-
Biscuit	26	24	2	-	-	-	-	20	6	-	-	-	-
Soft drinks	10	10	-	-	5	1	-	-	-	-	4	-	-
Ice-cream	12	12	-	-	-	-	-	10	-	-	-	2	-
Cutlet	18	18	-	-	-	-	-	9	-	-	9	-	-
Puffs	22	22	-	-	-	-	-	10	2	-	10	-	-
Juice	4	4	-	-	-	-	-	4	-	-	-	-	-
Squash	23	23	2	-	-	-	-	-	-	-	25	-	-

Details pertaining to the purchase of processed foods showed that out of the hundred respondents surveyed 70 per cent purchased bread/bun while 64 per cent of the respondents purchased cake; 51 per cent purchased fried item; 49 per cent of the respondents purchased sweets and 40 per cent purchased jam. The above processed foods, were purchased from bakeries, by majority of the respondents. Frequency of use, showed that these food items were consumed at least once in a week by majority of the family members.

Twenty nine per cent of the respondents reported that they purchased pickle and 26 to 22 per cent purchased biscuits, squash and puffs from bakeries. The frequency of use showed that they consumed these items at least once in a week. Twelve to eighteen per cent of the respondents surveyed purchased ice cream and cutlets also. Eleven per cent of the respondents agreed that they bought baby foods for feeding their babies. A low percentage of four to ten percentage of the total hundred respondents surveyed, used soft drinks and fruit juices.

From the above table it is clear that processed foods are consumed by most of the households surveyed and it forms an important items of their menu. This is in par with the study conducted by Maria (1989) on food consumption and energy expenditure of employed home makers in organised sector in Trivandrum, which revealed that bakery items and other processed

food items forms a major part of the daily menu of the population surveyed.

Feteh Singh (1989) has classified the processed foods into a) meat, poultry and dairy products b) fruits and vegetable and their products c) confectionery, biscuits and bakery products d) Honey, jaggery and sugar products e) cocoa and cocoa products f) alcoholic and non alcoholic beverages g) cereal products h) ground nuts and walnuts and i) pickles chutneys and papads. Arya (1992) stated that moist fried products, shelf stable fried products, popped or puffed cereal, expanded cereal, phoha, wafers, instant mixes, RTE products, canned convenience foods, breakfast cereals and fruit and vegetable based convenience foods are the most commonly available processed foods.

Apart from the purchase of processed foods from shops, many of the respondents stated that these items were also prepared in their homes. Out of hundred respondents surveyed a majority of 95 per cent prepared processed food items at home and this is possible if the house wives have knowledge, resources and help from others, in preparing these food items. To find out whether the respondents prepared these food items at home, they were asked, whether any of the family members helped them in preparing processed food at home. Among the hundred respondents 57 per cent opined that they got help from other members of the family. Twenty six per cent had their daughters to help them in preparing processed foods while two to fourteen per cent had

their sons, servants, husbands, mother or mother-in-law assisting them in preparing processed foods. This shows that majority of the housewives are able to prepare processed food at home if they are assisted.

Opinion of the respondents about the reasons for purchasing processed foods from shops, was also taken into consideration. Several questions, on this aspect were asked to the respondents to find out their reaction on these lines Table 11 indicates the reasons for purchasing processed foods as expressed by the respondents.

Table 11 Reasons for purchasing processed foods

Reasons	Number/percentage
Saves time	73
Satisfies childrens interests/likes	39
Lack of knowledge	28
Introduce variety	19
Better taste	17
Better shelf life	14
Children needs such nourshing foods (especially health drinks)	11
Do not possess appropriate machines	10
Profitable	4
Lack of adequate space in the kitchen	2
Prestigious	2
Bulk purchase is possible	1

From the table it is inferred that seventy three per cent of the respondents buy processed foods because it saves time. It may be noted that 63 per cent of the respondents are employed outside their home and this may be one of the reasons for purchasing foods from outside. Employment outside the home takes away a major share of the day time of the housewives, and more over the increase in purchasing power brought in through employment would boost up purchase of processed foods. This is in line with the study of Anon (1996), who revealed that employed housewives, depend on bakery items and other processed foods since she has less time to cook foods.

Thirty nine per cent were of the opinion that they purchased processed foods according to the interests and likes of their children. This may be due to the fact that children are usually attracted by the advertisement in TV and other mass media, and they compel their parents to buy such processed foods for them.

Twenty eight per cent opined that they do not have the know-how to prepare such foods at home. Many of the processed foods which are available in the market cannot be prepared by the middle class house wife. They are unaware of such novel technologies and modern machines of food production. Apart from this they do not know the correct composition of ingredients and additives used in the preparation of such processed foods. This

may be the reason for purchasing processed foods from outside. About 19 per cent of the respondents remarked that purchasing processed food helped them to introduce variety in the meal pattern seventeen per cent were of the opinion that such foods are tastier than the home made ones; and fourteen per cent opined that these foods have better shelf life. These qualities may be attributed to addition of additives that may enhance cosmetic value and shelf life or keeping quality since they are prepared on a commercial scale unlike the ones made at home. To those who are used to home made foods, the foods found on the shelves of shops may provide variety and better taste. According to Haridas Rao (1993) the popularity of bakery products is due to their ready to eat convenience nature, unique taste and ready availability at reasonable cost in different parts of the country including remote and rural areas.

It was the opinion of 11 per cent of the homemakers that they purchased processed foods to satisfy the children's need for it. In the modern days there is a pronounced change in the family structure. Nuclear families with two children or one child predominants the community. The families concerns are centered around the children and their demands and interests are given prime importance and that in turn will reflect in the selection and purchase of food materials also. Childrens' demands are highly influenced by their peer-group, and they try to mimic their counterparts and this could be one of the reasons

for increased purchase of processed foods from shops. According to Puri and Sanghera (1987) children are frequent consumers of processed foods than the adults of the households.

Four to ten per cent opined that they brought processed foods as they are profitable and they do not possess appropriate machine for their preparation while one to two per cent of the respondents purchased them as they think it is a matter of prestige. The purchase and installation of machineries used for preparation of the processed foods require money and adequate space. But most of the middle income families reside in small houses which may not be adequate to accomodate those machineries, like microwave oven food processor, cooking range, etc. One per cent opined that they can buy processed foods in bulk from shop so that energy and money can be saved and it is profitable when bought in bulk from shop. It may be seen that bulk purchases are cheaper than limited purchases, or preparation of small quantities of such foods at home since the processes are laborious, time taking and require collection of small quantities of several items.

From the above opinions of the respondents it is clear as to why they purchased processed foods. It is mainly because they help to save time. The modern living conditions have forced housewives to play a dual role and she does not have enough time

to cook several meals a day for the family. Hence she has to depend on processed foods or ready made foods. Thus processed foods are of grace to the modern house wife.

In this survey it is very important to find out the opinion of the respondents about the advantages and disadvantages of the purchase and use of processed foods. Table 12 and Table 13 depicts out the opinion of the respondents on the major advantages and disadvantages of purchasing processed foods.

Table 12 Advantages of purchasing processed foods

Advantages	Number/percentages of respondents
Saves time	67
Tasty	17
Readily available	14
Provides variety	10
Can be purchased according to need in terms of time and quality	7
Has better shelf life	5
Facilities growth of children	5
Helps to introduce change in food pattern	3
Good for health	2

The main advantage of purchasing processed food, as reported by 67 per cent respondents is that they help to save time. It is important to note that 63 per cent of the respondents were employed outside the home and this may be the

main reason as why the house wives depends on processed foods. Employed house wives have less time in preparing such food item at home, on processed food.

Seventeen per cent were of the opinion that processed foods purchased were tastier. While fourteen per cent stated that the processed foods are readily available as and when needed; seven per cent of the respondents opined that processed foods can be purchased according to need in terms of time and quality. Five per cent were of the opinion that processed foods have better shelf life than the foods prepared at home and they also opined that processed foods like health drinks facilitates growth of children.

Two to three per cent opined that processed foods helps to introduce change in the daily food pattern and also that processed foods are good for health.

From the above table it is clear that the major advantage of purchasing processed food is their time saving character.

Table 13 The disadvantages of buying processed foods

Disadvantages	Number/percentage
May cause disease	42
Costly	25
Quality not good	16
Chances for adulteration	12
Decayed substances may be sold	6
Inculcates idleness	5
Unhygenic	3
It may become habitual	1
Many of the processed foods cannot be prepared by common people	1

The response of hundred respondents with respect to the disadvantages of purchasing and consuming processed foods revealed that 42 per cent were of the opinion that consumption of large quantities of processed foods may cause diseases. This might have arisen from the fact that a large amount of additives are believed to be added to these foods to increase their shelf life and cosmetic value. Consumption of these additives may lead to many diseases. This opinion become to be reliable since Kaur (1988) has pointed out that nutrition researches conducted all over the world have shown that food additives used in processed foods have harmful effects on both physical and mental health and that children are found to be the worst effected being more vulnerable than adults.

Twenty five per cent of the subjects of the study opined that processed foods are more costlier than raw so that common man cannot buy it often. However 16 per cent of the respondants opined that the quality of processed foods were not good, while 12 per cent opined that chances for adulteration are high in processed foods. Owing to change of life style there is great demand for convenient, instant, ready to eat foods. But this food revolution would not have been possible without food additives and other chemicals and such situation encourages adulteration of food articles to some extend as pointed out by Manay and Shadaksharaswamy (1987).

Six per cent of the respondents opined that in many instances decayed substances are sold. Items like cutlets, which gets spoilt very easily are sold by the shop keepers. While 3 per cent opined that the foods are placed in unhygenic conditions. It can be noted that many of the street sellers sell foods under unhygenic conditions. These two opinion may have some truth in it since food stalls were full of flies and the floor littered with food crumb and paper is a common scene in India.

Another disadvantage pointed out by 5 per cent of the respondants were that buying processed foods from outside inculcates idleness. Only one per cent opined that many of the processed foods cannot be prepared by ordinary housewives. Such preparations calls for special skill and basic knowledge of cooking.

It may be noted that there are other advantages of purchasing and using processed foods, as it help to save time and help to add variety, at the same time it is pointed out by five per cent of that it inculcates idleness. As processed foods are easily available, people depend on packed foods rather than preparing them at home. Another equally important disadvantage is that some of the processed foods cannot be prepared by an ordinary house wive as these requires skill and equipment in their production which cannot be afforded by the common man.

4.1.3 Knowledge of the respondents about the sanitary quality and presence of adulterants in processed foods

In this study it is essential to test the knowledge of the respondents about the sanitary quality and adulterants present in processed foods. Most processed foods contain some food additive and if this additive is not a permitted one or present in excess amount the food turn adulterated. In some instances if the processed food are prepared under unhygenic conditions, it may lead to contamination, which may cause diarrhoea and vomiting. In both cases the consumers are suffered and in this survey it is very important to test the knowledge of the respondents on sanitary quality and adulterants present in processed foods.

One hundred respondents were surveyed to find out their awareness and knowledge about the sanitary quality and presence

of various adulterants in processed foods. Through this survey an attempt was also made to find out the depth of knowledge they had pertaining to the hazards of food adulteration. Questions were asked to the respondents, concerning food adulteration, its harmful effects; ways to which foods are adulterated and what can be done to check food adulteration.

Table 14 and 15 gives an idea about the opinion of the respondents about food adulteration and its hazards.

Table 14 Concept of the respondents about what is food adulteration

Concepts	Number/percentage
Addition of harmful substances	38
Selling of banned substances	26
Addition of cheap substances	18
Addition of useless substances	16
Selling products which differ in quantity and quality	14
Selling of spoilt substances	10
Selling of duplicate substances	9
Selling of non-nutritive substances	5
Selling of products which are below their standard weight	5
Selling substances which deteriorates easily	4
Abstraction of nutritive substance from food	4
Selling of materials which contain added stones and dirt	3

As given in the table, 38 per cent of the respondents endorsed that food adulteration means addition of harmful substances while twenty six per cent opined that food adulteration is selling of banned substances; eighteen per cent reported that food adulteration is addition of cheap substances to wholesome foods; sixteen per cent are of the view that it is addition of useless substance; while fourteen per cent were of the opinion that the product will differ in quantity and quality.

Five to ten per cent of the respondents opined that food adulteration, according to them is selling of products which are below their standard, selling of products which are non-nutritive and consisting of substances thatwere below standard and selling spoilt substances, while three to four per cent of the respondents opined that food adulteration means selling materials containing added stones and dirt or selling non-tasty foods which deteriorate easily.

From the above remarks it can be concluded that many of the respondents surveyed were aware of the problem of food adulteration. Food adulteration in simple words mean addition or abstraction of substances so as to cheat, cheapen, or falsify a material. And from the above remarks it is clear that many of the respondents surveyed were aware of term 'food adulteration' and have basic knowledge about the ways in which foods are usually adulterated, but some are not fully aware of food

adulteration. However, this could be achieved through imparting awareness among people about the hazards food adulteration and this calls for concerned efforts among different categories of people to counteract the hazards of adulteration.

Table 15 Hazards of food adulteration

Hazards	Number/percentage
Causes diseases	74
Deteriorates the health status	17
Causes diarrhoea	8
Causes digestive problems	7
Customers are being cheated	4
Makes food less tasty	4
Causes vomiting	4
Causes economic loss	4
Causes food poisoning	3
Causes dental caries	2
Deteriorates the quality of food	2
Causes death	1

Table 15 depicts the hazards of food adulteration as reported by the housewives interviewed. A majority of 74 per cent of the respondents stated that food adulteration causes diseases, while 17 per cent were of the opinion that it deteriorates health. Eight per cent were of the opinion that food adulteration causes diarrhoea while 7 per cent felt that food

adulteration leads to many digestive problems. This may be attributed to the consumption of poor quality foods. Often the consumer is forced to buy ready made and packed advertised foods under necessity or in the interests of other members of the family and seldom bothers about its quality which may lead to diseases or functional disorders.

Four per cent of the respondents endorsed that adulterated foods are less tastier and some time consumption of these adulterated foods, cause vomiting. They argued that buying these foods is an economic loss to the consumer and they also agreed that the customers are being cheated at one way or other. Three per cent of the respondents stated that food adulteration leads to food poisoning, dental caries and even death. These hazards of food adulteration may be due to the consumption of processed food, stored for a longer time under unhygienic condition which might become hazardous to the consumer. Many people might not look for the date of expiry and manufacturing date and might buy such foods which might also cause health hazards.

From the table it is clear that the respondents are unable to fully define the term food adulteration but they have an idea of the hazards of food adulteration. From this it can be assumed that the awareness about adulteration is growing fast. This may be due to the various consumer awareness movements that

are in operation as rightly reported by Srinivasan and Veena (1982) who have stated that consumer awareness has however been steadily growing thanks to the activities of consumer guidance organisations and the general expansion in women's education.

Preservatives, chemicals and other additives are added to processed foods to improve their quality or shelf life. The chances of adulteration in processed food, thus becomes very high. Questions were asked to the respondents to find out the extent of adulteration in processed foods seventy four per cent opined that food adulteration is highest in processed foods while the remaining argued that adulteration is higher in processed foods than unprocessed foods. From this it can be understood that the consumers were aware of the fact that processed foods are usually adulterated to a higher extent than raw foods.

Apart from this the respondents were asked about the ways to prevent adulteration. Only 32 per cent of the respondents, were able to suggest ways to prevent adulteration. They considered quality marks as an assurance for good quality foods and they stated that they go for such 'quality' foods while a minority, remarked thatifthey had any doubt of food that were adulterated they would report it to the police. From this it is clear that only a minority of 32 per cent were aware of prevention of food adulteration. Any solution to this problem of food adulteration can only be achieved when the consumers join

their hands with the Government. Girija (1995) complains that consumer seldom bothers about quality and often hesitates to initiate action against this social malady. Ignorance indifference and unpreparedness lead to a passive victim of food adulteration.

Freshness, colour, appearance, brand name etc. are considered to be the quality in connection of foods. Quality determination is important in selection of bad quality according to the respondents means a form of adulteration. And in this study it is important to know the opinion of the respondents whether they check for the quality standards prescribed for food. Quality standards was very much important, while purchasing foods. Respondents were asked as to how they select products that has good quality attributes. The response of the respondants are given in Table 16.

Table 16 Quality parameters which the respondents look for

Quality attributes	Number/percentage of respondents
Freshness	94
Colour	94
Weight of food	87
Appearance	90
Date of manufacturing	90
Date of Expiry	90
Brand name	82
Contents	84
Company name	84

Among the hundred respondents surveyed 94 per cent of the respondents look for freshness and colour of food in order to ensure the quality of the foods. Ninety per cent were of the opinion that appearance, and presence of manufacturing and expiry date are the important quality attributes. Eighty four per cent of the respondents remarked that the name of the company or name of the product, and the list of ingredients presented in the table gives an indication to assess the quality of product. While 82 per cent looked for brand name as an indication of quality of products.

From the table it is clear that about 82 per cent of the respondents surveyed were aware of some of the ways to assess the quality of processed foods. This may be due to high educational level and awareness of Keralites. According to Anvita et al. (1993) less educated respondents give more preference to taste and more educated respondents gave more preference to qualities of nutritious input, list of ingredients and freshness of the product.

Place of purchase, is an important factor in selecting good quality foods. In selected bakeries and other standard shops, foods are displayed and sold under hygienic conditions compared to that sold by street vendors, through Thattukada and that sold from festival grounds where these foods are kept open when questions were asked to respondents to know the place of

purchase. This would have profound influence on the sanitary quality of such foods. Table 17 shows the place from which the respondents purchased processed foods.

Table 17 Place of purchase of processed foods

Place of purchase	Number/percentage of respondents
Bakery	89
Hotel	2
Thattukada	2
Festival grounds	5
Do not purchased processed foods	5
Total	100

From the above table it is clear that eighty nine per cent of the respondents brought processed foods from bakery and only 2 per cent of the respondents bought it from hotel, Thattukada or from festival grounds.

This table gives an indication that the people are aware of the harmful effects of eating processed food sold from public places like festival grounds. Due to the awareness that respondents have regarding the hygienic aspects of food, which could be attributed to the influence of their level of education or the influence of mass media.

Table 18 Sanitary quality parameters of foods

Quality parameters	Number/Percentage
Presence of dust, stones and dirt present	97
Availability in packets	97
Cleanliness of the shop	96
Whether flies are seen in the selling place	94
Cleanliness of the salesman	94
Whether food is kept covered or not	93
Neatness of the packet used	91
Whether the food has deteriorated	90

As given in table 18, about 97 per cent of the respondents look for the sanitary parameters like the presence of dust, stones and dirt in foods before buying them. They also checked whether the processed foods are available in packets or not. Ninety six per cent of the respondents were conscious of the cleanliness of the shop in which the food is displayed; ninety four per cent of the respondents looked for the cleanliness of the salesman and whether flies are seen in the selling place. Ninety three per cent of the respondents checked whether the food are kept covered or not. Ninety one per cent checked the cleanliness of packets used for covering the food and ninety per cent looked whether the food available are deteriorated or not, before purchasing the processed foods from the shops.

From the above details it can be concluded that majority of the respondents are aware of the significance of sanitation and hygiene inorder to ensure the safety, wholesomeness and soundness of food. (Anon. 1990). Diseases are transmitted by contaminated foods. Hence it is important to check the sanitary quality of foods.

Processed foods play a very important role in our lives today with more and more women going out of the house to work the time and energy spent in cooking foods need to be decreased substantially. Processed foods are not only convenient to use but can be stored for a longer period of time. These foods add variety to the diet as well as improves the quality of food.

The quality of these products are is strictly controlled since most of these products, require a quality control marks like the FPO Agmark, ISI etc. Only the products which meet the quality condition are given quality marks. All the above factors with respect to processed foods might have led to the high consumption of such foods in Trivandrum.

Apart from the advantages of using processed foods there are many disadvantages of using processed foods. These foods are prepared under unhygenic conditions which might lead to contamination, resulting in health disorders. Another disadvantage is that some of these foods are processed using chemical like artificial colours, preservatives, antioxidants,

emulsifiers, flavour and taste inprovers, some of these pose a great threat to the health of people. Efforts should be taken for strengthening food quality control measures in our country.

4.1.4 Distribution pattern of families based on the frequency of consumption of processed foods

As a part of the survey on the use of processed foods among households details pertaining to various processed foods consumed by the families were assessed and quantity of each item consumed were collected.

There were about 15 different items consumed by every family and the quantity purchased varied from family to family. These 15 items were categorised into five major groups namely (1) baked items (2) fruit based products (3) fried item (4) sweets and (5) other miscellaneous items.

From details on the various processed foods consumed and the quantity consumed the frequency of consumption and average of mean quantity of item consumed were found out. Then the families were categorised into three groups viz. low, medium and high groups as follows. The families which consumed the item that had a frequency that came below the value of mean$\pm$SE were classified as "low frequency" and those which come above mean $\pm$ SE were classified as 'high frequency'. The distribution pattern of families in relation to frequency of consumption of various processed foods in terms of quantity are given in table 19 to 23.

Table 19 Distribution of families based on the frequency of consumption of baked items

Food item	No.of families consuming the item (n = 100)	Quantity consumed per week (per capita) Minimum (kg)	Maximum (kg)	Mean±SE	Distribution of families passed on consumption of the food item: Low (< mean±SE	%	Medium mean SE	%	High (> mean±SE	%
Cake	66	14	504	217±133	7	11	49	74	10	15
Bread	74	84	203	161±161	3	14	71	96	0	0
Biscuits	26	7	98	42±35	4	15	20	77	2	8
Puffs	22	0.7	4.9	1.4±0.89	1	5	10	45	11	50

Table 19 shows the distribution of families based on the frequency of consumption of baked items. Out of 100 families surveyed 74 families consumed bread and 66 families consumed cake. The mean quantity of bread consumed by an individual on weekly basis was 161 grams and that of cake was 217 grams.

Only 26 per cent of the families consumed biscuits. 22 per cent of family (out of 100 families) surveyed consumed puffs. Distribution of families based on consumption pattern of baked food items showed that majority of the families were in the medium frequency range. As far as the consumption pattern of bread was concerned a majority of 71 families (96 per cent) were in medium frequency (161±161). In case of cake 49 families (74 per centwere in medium frequency level (217 ± 133g).

In the case of biscuits 77 per cent were in medium frequency level (1.4±0.89 gms). Baked items were consumed by majority of the respondents. This may be due to the fact that these baked item are easily digestable and nutritious. Hardias Rao (1993) has brought into light the reasons for the popularity of the bakery items. According to him it is due to their ready to eat nature and reasonable cost in different parts of the country.

Rognerud et al. (1983) also have stated the advantages of consuming bread. They noticed that the quality factors, such as taste nutritive value and maintenance of freshness, convenience and economy are the major determinants promoting its purchase. Anvita (1988) in a study on the role of bread as a source of supplying protein, revealed that 201 g of bread and roll supplied 14.5 g of protein.

The heavy consumption of cakes may be that they are usually served with evening tea and also as it is served as a main snack item served for guests. The aroma and taste of cake, might be also a reason for its increased consumption.

Smith (1972) brought out the advantages of taking biscuits as the one that it (a) satisfies momentary hunger pangs (b) delays the onset of further hunger pangs for many hours (c) maintains bodily health and functions (d) supplies protein,

vitamins and minerals. All the above advantages mentioned for the baked products might have contributed to the increased use of these items.

Table 20 Distribution of families based on the frequency of consumption of fruit based products

Food item	No. of families consuming the item (n = 100)	Quantity consumed per week (per capita) Minimum ml	Maximum ml	Mean±SE	Distribution of families passed on consumption of the food item: Low < mean±SE	%	Medium < mean SE	%	High > mean±SE	%
Jam	39	7g	28g	21±14	0	0	37	95	2	5
Squash	25	7.7	512	210±203	6	34	19	76	0	0
Soft drinks	10	28	399	161±140	3	30	7	70	0	0
Juice	4	47	57	56±7	0	0	3	75	1	25

Distribution of families based on the frequency of consumption of fruit based products are given in Table 20. Out of 100 respondents surveyed jam was consumed by every person in the family at least once with a week. Out of 100 families surveyed 25 families consumed jam and 210 ml of squash (equal to 1 bottle) was consumed by an individual on weekly basis.

In the case of soft drinks 10 per cent families consumed them and 4 per cent of the families consumed fruit juice. About 161 ml of (1 bottle) of soft drink is consumed by a person in a week.

Distribution of families based on the consumption pattern of fruit based products showed that majority of the respondents (70 to 95 per cent) were in medium frequency level. In case of jam, distribution of family based on its consumption showed that 87 families (95 per cent) were in medium frequency range (21±14g) while distribution of families based on the consumption of squash showed that 19 families were in medium frequency range (210±203 ml). In case of soft drinks and juice 70 per cent and 75 per cent of the families were in medium frequency ie (161±140 ml and 56±7 ml).

From the table it is clear that squash and jam were the items consumed by the majority of families (ie. per cent and 25 per cent of families). This may be due to the fact that compared to soft drinks and juice, jam and squash have longer shelf life, hence can be kept for longer period. Another reason may be that the soft drinks are much costlier than other fruit based items like fruit juice, ie 1 bottle (250 ml) of fruit drinks costs 6.50 rupees, while 1 bottle (200 ml) of fruit juice costs only 3.00 rupees and such processed foods cannot be afforded by common man.

Anvita et al. (1993) had stated that jam was the most preferred processed food by the people of Punjab, which indicates the increased preference for jam which is a fruit based product.

Table 21 Distribution of families based on the frequency of consumption of fried items

Food item	No.of families consuming the item (n = 100)	Quantity consumed per week (per capita) Minimum g	Maximum g	Mean±SE	Distribution of families passed on consumption of the food item: Low < mean±SE	%	Medium < mean SE	%	High > mean±SE	%
Chips	53	28	336	196±98	7	13	39	74	7	13
Cutlets	18	0.14	3.5	1.4±0.7	3	17	13	72	2	11

Table 21 shows the distribution pattern of families based on the frequency of consumption of chips and cutlet. Fifty three per cent (out of 100 families surveyed) of the famiies consumed chips. About 196 gms of chips was consumed by every individual in a day. Distribution of families based on consumption of chips showed that about 34 families (74per cent) were in medium frequency (196±98 gm).

More than half of the respondents purchased and consumed fried items. The reason for this may be that the teenagers are the frequent consumers of fried items. They believe that the fried item will give them extra energy and power. Another reason of purchasing the chips is that these items have more shelf life than other bakery items. Anon (1990) stated that frying gives a rich flavour and texture to food and makes it crisp. There is also an increase in the energy value of food when it is fried. Another advantage of frying is that due to temperature used in frying, microorganisms present in food are

destroyed. These advantages might have contributed to the high frequency of use of fried item compared to others.

Table 22 Distribution of families based on the frequency of consumption of sweet items

Food item	No.of families consuming the item (n = 100)	Quantity consumed per week (per capita) Minimum g	Maximum g	Mean±SE	Distribution of families passed on consumption of the food item: Low < mean±SE	%	Medium < mean SE	%	High > mean±SE	%
Sweets	50	49	875	210±140	4	8	40	80	6	12
Toffee	16	21	252	14±778	1	6	12	75	3	19

Table 22 shows the distribution pattern of family based on frequency of consumption of sweets. While 50 per cent consumed sweets only 16 per cent of the families consumed toffee. About 210 g. are consumed weekly by an individual in a family.

Distribution of family based on the consumption of sweets showed that majority (80 per cent) of the families were in medium frequency range.

Children usually prefer sweets other than any confectionary items. Usually sweets are purchased in bulk as they have more shelf life. In many families sweets are usually served to guests and relatives. Potty (1980) reported that various sweet items are served at home and in other public places with subtle differences in blends and flavour. Sweets are prepared, to celebrate special occassion also.

Table 23 Distribution of families based on the frequency of consumption of other miscellaneous items

Food item	No.of families consuming the item (n = 100)	Quantity consumed per week (per capita) Minimum g	Maximum g	Mean±SE	Distribution of families passed on consumption of the food item: Low < mean±SE	%	Medium < mean SE	%	High > mean±SE	%
Ice cream	7	35 ml	105	84±56 ml	1	14	6	86	0	0
Pickle	29	50.4	1169	126±203	1	3	14	48	14	48
Bakery foods	11	0	497	497±0	11	100	0	0	0	0

As indicated in the table 23 pickle is consumed by 24 of the families surveyed. 11 per cent amily purchased baby foods while only 7 per cent of the families consumed ice cream. About 120 g (1 bottle) pickle and 84g of ice cream (equal to 3/4 cup) were consumed on weekly basis by every individual. Only 16 families purchased baby foods as these families had children under the age of 4 years.

Distribution of families based on the consumption of pickle showed that 14 families 48 per cent were distributed in medium and high frequency level. In the case of baby foods distribution of all families were in the low frequency level (497±0 gm). Distribution based on consumption of ice cream showed that of 86 per cent were in medium frequency level (84±56 ml).

Compared to ice cream and baby foods, pickles was consumed by majority of the families. The consumption pattern of processed foods, as reported by Anvita et al. (1993), also showed that jam and pickle were the most preferred processed foods. Many of the consumers purchased pickle and jam as they have more shelf life and easy for storage.

From the above results it was found that items like cake, biscuits, bread, sweets, chips (banana chips), jam, squash, ice cream and milk powder were the items that were consumed (preferred) by most of the family members. Hence these foods were selected for detailed chemical analysis. From this packed and items that have 'quality marks' were excluded.

4.2 A survey among selected shops to find out extend of sale and availability of processed foods in selected areas of Trivandrum city

The ultimate aim of this study was to find out the sanitary quality and adulterants present in selected processed foods. From the initial survey explained earlier, the processed foods, commonly purchased and consumed by selected 100 households of Trivandrum were identified. Since the above survey covered only a minor section of the population of Trivandrum, it was decided to find out the array of processed foods available from the shops of Trivandrum city, that are open to the consumers of

the city, so as to further identify the items which are purchased most frequently in greater quantity. Thus this was used as a method to select the commonly consumed processed foods, from the seller's point of view.

With this view an inventory survey was conducted among 100 shops of Trivandrum city. Based on the area map of Trivandrum city 15 areas where there are shops that sell processed food items were initially located. The 15 areas selected were East Fort, Ulloor, Medical College, Sasthamangalam, Peroorkada, Statue, Thampanoor, Pettah, Pattoor, Sreekariyam, Vazhuthacadu, Overbridge, Bakery junction, Palayam and Kesavadasapuram. The processed food items available in the selected shops and the quantity of each item sold on a daily basis was collected seperately from each area. Details with respect to nature and quantity of processed foods sold from each area are presented in Appendix III.

The data thus collected revealed that there were 58 number of items, the nature of which varied considerably. Hence, for convenience in explaining the nature of the products, the items in general were classified into 10 groups. The groups consisted of (1) cake items (2) bread (3) biscuits (4) fried items (5) snack items (6) dairy products (7) beverages (8) sweets (9) health drinks and (10) other miscellaneous items.

It was observed that all the 58 items were not sold by every shops and also that the quantity of sale varied from shop to shop.

From details on the various processed foods sold and the quantity sold the frequency of sale and average or mean quantity of item sold were found out. Then the shops were catogorised into three groups viz. low medium and high as follows. The shop which had a frequency that came within the value of mean±SE were classified as "medium frequency", and those which had a frequency below the mean±SE were classified as "low frequency" and those which come above mean±SE were classified as "high frequency". The distribution pattern of families in relation to frequency of sale of various processed foods in terms of quantity are given in table 24 to 34.

Table 24 Distribution of shops based on the frequency of daily sale of cake items

Food item	No.of shops from which the item is sold (n = 100)	Total Quantity sold (kg)	Range of the items amount sold		Distribution of shops based on frequency of sale						
			Minimum (kg)	Maximum (kg)	Mean±SE (kg)	Low (< mean±SE)	%	Medium (< mean SE)	%	High (> mean±SE)	%
Plain cake	71	455	1	15	6.4±4.2	10	14	50	70.5	11	15.5
Fruit cake	65	306	1	15	4.7±3.35	19	14	53	82.0	3	4.0
Plum cake	66	246	1	15	3.8±2.4	4	6	58	88.0	4	6.0
Cup cake	64	340 nos.	1	15	5.3±4.3	10	16	51	80.0	3	4.0
Sponge cake	30	134	1	15	4.45±3.16	4	13	23	74.0	4	13.0
Pastry	17	715 pieces	10 pieces	75 pieces	38±18	1	6	12	71.0	4	23.0

Table 24 indicates that plain cake, fruit cake, plum cake, cup cake, sponge cake and pastries were the most moving cake items in Trivndrum city. Among the different cake items plain cake was sold from 71 shops. Approximately 455 kg of plain cake were sold in a day from Trivandrum city and it recorded highest mean of 6.4 ± 4.2 kg. It was followed by cup cake and it was sold to an extend of 340 kg per day with a mean of 5.3 ± 4.3 kg. The mean quantity of fruit cake and sponge cake were more or less the same ie 4.7± 3.55 and 4.5 ± 3.6 kg respectively. While lowest (mean) quantity was noticed in the sale of plum cake and it scored a mean of 38 ± 2.4 kg per day. In case of pastry 715 pieces were sold from 17 shops. The mean quantity was 38.5 ± 18 (number).

With respect to the distribution of shops based on the frequency of sale of cake items; it showed that maximum number of shops belonged to medium frequency level (70.5 to 87.9 percentage). In case of plain cake, distribution of shops showed that 70.5 per cent (ie 50 shops) were in medium frequency level (6.4 ± 4.2 kg); and for plum cake also a majority of 58 shops (87.9 percentage) belonged to medium frequency level (3.8 ± 2.4). Out of the 100 shops surveyed fruit cake and cup cake were sold from 53 shops (82 percentage) and 51 shops (80 percentage) respectively were in the medium frequency range (ie. 4.7 ± 3.35 kg and 5.3 ± 4.3 kg).

From the above table, it could be inferred that plain cake was sold to a higher extent followed by cup cake when compared to other items, with respect to the number of shops from which cake items are sold, and with respect to the frequency of sale of other items. This could be attributed to the price variations ie 1 kg of plain cake costs 50 to 55 rupees, while the cost of plum cake ranged from 60 to 65 rupees. In this case it may be difficult for the customer to buy plum cake spending such a large amount. Preferences with respect to taste may also be another reason for purchasing plain cake in larger quantities than plum cake. From the dietetic point of view the plain cake is easily digestible and it could be consumed by all members of the household, irrespective of the age or physiological state of the consumer. While the plum cake may not be advisable to very young children or person suffering from ulcer disorders etc.

Table 25 Distribution of shops based on the frequency of daily sale of bread and bun items

Food item	No.of shops from which the item is sold (n = 100)	Total Quantity sold (packets)	Range of the items amount sold		Distribution of shops based on frequency of sale						
			Minimum (packets)	Maximum (packets)	Mean±SE (packets)	Low (< mean±SE)	%	Medium (< mean SE)	%	High (> mean±SE)	%
Common bread	69	1587	3	80	23±16	9	13	56	81	4	6
Sweet bread	64	1408	3	80	22±17	6	9	58	91	0	0
Fruit bread	52	728	5	50	14±11	3	6	49	94	0	0
Bun	50	850	2	100	17±19	7	14	43	86	0	0
Butter bun	18	378	5	50	21±16	3	17	13	72	2	11

Frequency of sale of various types of breads from the different shops belonging to the 10 areas of Trivandrum city is presented in Table 25. The table indicates that common bread, sweet bread and fruit bread, were the various bread items sold from different shops of Trivandrum city. Buns and butter buns were also sold from various shops. On an average, about 23 loafs of common bread and 22 loafs of sweet bread were sold daily from 69 and 64 shops respectively (out of the total 100 shops surveyed). Fruit bread was sold from 52 shops and its sale accounted to a mean quantity of 14 loafs per day.

About 850 packets (containing 4 number each) of bun were sold from 50 shops of Trivandrum city in a day while approximately 378 packets of butter bun were sold from 18 shops.

Distribution of shops based on the frequency of sale of common bread showed that 56 shops (81.2 per cent) were in medium frequency range (23 ± 16 loaves). In case of sweet bread and fruit bread also a majority of 58 and 49 shops (91 percentage and 94 percentage) which sold bread on a daily basis were in medium frequency range (22 ± 17 and 14 ± 11 loaves).

With respect to the sale of buns and butter buns also 86 percentage and 72 percentage of shops were in medium frequency range.

It is clear that common bread was sold in greater numbers than fruit bread, sweet bread or bus. This could be attributed to the fact that common bread can be consumed by every

person, irrespective of age and other health conditions. Another reason as reported by Albert Daniel (1971) is applicable in the present study also. He states that was bread contains a high percentage of carbohydrate, a fair percentage of protein but a very low percentage of fat, and this makes bread a universal food item. It may also be noted that sale of butterbuns is very low. This may be because of the fact that butter coated filled or enriched foods cannot be taken by all especially those who have disorders like arteriosclerosis, diabetis and obesity. Another reason for their lessened use may be that items with butter may get easily spoilt than other bread items especially common bread. More over such easily spoilt foods requires special storage facility which may increase the over head charges to be paid by the shop keeper of which would be passion to the consumer. Price variation might also influence the purchase of baked foods mentioned above. (1 packet of bun price about 3-4 rupees), but 1 loaf of bread costs rupees 5-6 rupees. If the quantity of both bread and bun is compared, bun weighs only 150-200 grams while bread weighs about 450-500 grams.

Another reason for higher consumption of bread, as noticed by Rognerud et al. (1983) stated that quality factors such as taste, nutritive value and maintance of freshness; convenience and economy were the major determinants promoting its purchase. According to Haridas Rao (1993) the popularity of the

bakery products is due to their ready to eat nature and reasonable costs in different parts of the country.

Table 26 Distribution of shops based on the frequency of daily sale of biscuit items

Food item	No.of shops from which the item is sold (n = 100)	Total Quantity sold	Range of the items amount sold		Mean±SE	Distribution of shops based on frequency of sale					
						Low		Medium		High	
			Minimum	Maximum	(kg)	(< mean±SE)	%	(< mean SE)	%	(> mean±SE)	%
Biscuit (Company)	63	756 packets	1 packets	50 packets	12±9.5 packet	10	16	50	79	3	5
Biscuit (local)	60	228 kg	2 kg	30 kg	3.8±3.9 kg	2	3	56	94	2	3

Distribution of shops based on the frequency of sale of biscuit items are given in Table 26. Local and company made biscuits were sold from different shops of Trivandrum city. About 756 packets (400 gm/pack) of company made biscuits were sold from 63 shops (out of 100 shops), while 228 kg of biscuits made by local bakeries were sold from 60 shops of out of 100 bakeries surveyed. The mean quantity of company made biscuits sold was 12 packets and that of locally made biscuts were 3.8 kg per day.

The distribution of shops based on the frequency of sale of company made biscuits showed that 50 shops (79 per cent) belonged to medium frequency level (ie equal to mean±SE). In

case of locally made biscuits also a maximum of 94 per cent (56 shops) were in medium frequency level.

From the above table it can be inferred that both kind of biscuits were sold in considerable quantities. This may be attributed to the fact that parents prefer biscuits compared to other bakery items for their children. They purchase biscuits for their children since it is considered to be easily digestable and nutritious. William (1983) stated that biscuits are specially notworthy among the younger patrons at schools and colleges. In many of the families biscuits are purchased and served as a major items for evening tea or used as a mid-morning or mid-afternoon snack for children or for the elderly. In a study reported by Maria (1988) it was stated that biscuits form a major item served with evening tea. It was also reported that biscuits were the most preferred baked item among all bakery items.

Smith (1972) has brought out advantages of taking biscuits. He stated that it (a) satisfies momentary hunger pangs (b) delays the onset of further hunger pangs for many hours (c) maintains bodily health and functions (d) a material that supplies protein, vitamins and minerals.

Table 27 Distribution of shops based on the frequency of daily sale of sweets

Food item	No.of shops from which the item is sold (n = 100)	Total Quantity sold (packets)	Range of the items amount sold		Mean±SE (packets)	Distribution of shops based on frequency of sale					
			Minimum (packets)	Maximum (packets)		Low (< mean±SE)	%	Medium (< mean SE)	%	High (> mean±SE)	%
Jelabi	74	2294 Nos.	5	150	31±33	5	7	69	93	0	0
Laddu	68	2176 Nos.	5	150	32±33	6	9	62	91	0	0
Jam roll	7	190 Nos.	15	30	27.2±5.6	1	14	5	72	1	14
Dilkush	13	292 Nos.	6	100	22.5±31.4	1	4	4	30	8	62
Nancuts	21	46 Nos.	1	5	2.0±1.0	4	19	17	81	0	0
Mysore pak	16	40 Nos.	1	5	2.5±1.0	6	33	12	67	0	0
Boli	9	104 Nos.	5	20	11.6±5.0	2	22	6	67	1	11
Groundnut sweets	59	342 Packets	2	20	5.8±5.8	5	8.5	54	91.5	0	0
Gingelly sweets	32	128 Packets	1	12	4.0±2.5	3	9.0	27	84	2	7
Halwa	60	276 kg.	1	15	4.6±3.5	10	17	44	73	6	10
Toffee	29	116 kg.	1	5	4.0±6.0	2	7	17	59	10	34

Table 27 shows the distribution of shops based on the frequency of sale of sweets. The various sweets sold from the differnt shops of Trivandrum in accordance with amount sold reveals that jelabi, laddu, halwa and groundnut sweets, were sold at a higher rate than other sweet items such as boli gingelly sweets, toffee, nancuts, dilkush and jamroll.

Out of the 100 shops, jelabi and laddu were sold from 74 and 68 shops respectively and approximately 2000 numbers each,

were sold in a day. This was followed by halwa, which was sold from 60 shops (out of 100 shops surveyed). The mean quantity of halwa sold in a day was 4.6 ± 3.5 kg per day. Next to it, groundnut sweets was sold from 5.9 shops. And about 342 packets of ground nut sweets were sold in a day.

An assortment of Toffee were sold from 29 shops while gingelly sweets was sold from 32 shops. The mean quantity of toffee sold was 4.0 ± 6.0 kg and that of gingelly sweets was 4.0±2.5 packets. The sweets that had lowest sale were Mysore pak and nancuts (2.5 ± 2.0 numbers and 2.0 ± 1.0 numbers). They were sold from 16 and 21 shops (out of 100 shops) respectively.

Distribution of shops based on the frequency of sale of sweets showed that maximum number of shops belonged to medium frequncy level. In case of jelabi and laddu, distribution of shops showed that a majority of 69 and 62 shops (93 per cent and 91 per cent) were in medium frequency range. While distribution of shops based on the sale of ground nut sweets and gingelly sweets, a maximum number of 54 and 27 shops (91.5 per cent and 84 per cent) were in medium frequency level of sale (5.8 ±5.8 and 4.0±2.5 packets). In case of halwa and toffee, distribution of shops showed that 73 per cent (44 shops) and 59 per cent (17 shops) of shops were in medium frequency of sale (ie. 4.6±3.5 kg and 4.0±6.0 kg). Distribution of shops based on the frequency of sale of mysore pak and boli were found to be same ie. 67 percentage.

It could be inferred that jelabi and laddu were the most moving items sold from the selected shops of Trivandrum city. This may be attributed to the fact that Trivandrum is a city of traditions with respect to food habits and taste profiles. Potty (1980) reported that various sweet items are served at home and in other public places with subtle differences in blends and flavour. Another reason is that these sweet preparations have better shelf life, hence can be kept for longer periods, when compared to savories. From the study it was surprising to note that nancuts and mysore pak, were the least sold ones among the sweets. From a general observation it was found that nancuts had poor appearance and that could be a reason for their poor sale. The mysore pak samples, when inspected were fond to be very poor in taste. They also had poor appearance with large wholes here and there. The poor taste itself indicated that the flour used was adulterated and that they were not made in pure ghee. They did not have appetising flavour which is characteristic of mysore pak, which is one of the most traditional sweet of south India. Thus it can be inferred that item of poor quality were rejected by two consumers which is indicated by poor sale proceeds.

Table 28 Distribution of shops based on frequency of daily sale of beverages

Food item	No.of shops from which the item is sold (n = 100)	Total quantity sold (bottles)	Range of the items amount sold		Mean±SE (bottles)	Distribution of shops based on frequency of sale					
			Minimum (bottles)	Maximum (bottles)		Low (< mean±SE)	%	Medium (< mean SE)	%	High (> mean±SE)	%
Carborated beverages	83	1992	10	50	24±11	9	11	64	77	10	12
Fruit juice	71	1562	10	50	22±9.7	26	37	64	77	11	16
Soda	30	132	10	50	4.0±4.0	1	33	29	97	0	0
Rasna	34	116	1	7	3.4±3.6	0	0	34	100	0	0
Squash	15	62	1	14	4.1±6.6	1	7	3	20	11	73

Frequency of sale of various types of beverages from the different shops belonging to the 14 areas of Trivandrum city are presented in Table 28 Carbonated beverages, soda, fruit juices, and squash were the various beverages sold from the selected 100 shops of Trivandrum city. Carbonated beverages, fruit juices and soda were available from the market in ready-to-drink from while squash and rasna were available in the form of concentrates.

Carbonated beverages and fruit juices were the items sold in abundance among the beverages. After surveying the 100 shops it was found that approximately 1500 bottle of fruit juices and carbonated beverages each were sold from 71 and 83 shops in a day and it recorded a mean of about 22±90 bottles and 24±11

bottles. About 130 bottles of soda were sold from 30 shops and it recorded a mean sale of 4±4 bottle. On an average, 4 bottles of squash were sold from 15 shops of Trivandrum city. The sale of Rasna was almost equal to that of squash.

The distribution of shops based on the sale of carbonated beverage and fruit juices showed that a mjority of 77 percentage (64 shops) were in medoum frequency level (ie = 22±10) bottles). Distribution of shops based on the sale of soda and rasna were also in medium frequency level (97 % and 100 %). While in case of squash a maximum of 11 shops (73 %) were in high frequency level. (ie. 7 bottles).

As reported earlier, the sale of carbonated beverages and fruit juices ranked higher than others because they think these items are good for health. Sumati and Shalini (1991) stated that beverages help not only to quench thirst, but aid the movement of food in the body. William (1983) has also added that the main contribution of carbonated beverages is that it supply energy from sugar present in it. He opined that fruit juices provide some vitamins, minerals and sugar depending on the fruit used to prepare them.

Another reason for the heavy sale of carbonated beverages is that taste and in many instances they are regarded as an item of prestige. Mass media also play an important role in promoting the consumption of such beverages.

Table 29 Distribution of shops based on the frequency of daily sale of fried items

Food item	No.of shops from which the item is sold (n = 100)	Total Quantity sold (kg)	Range of the items amount of item sold		Mean±SE (kg)	Distribution of shops based on frequency of sale					
			Minimum (packets)	Maximum (packets)		Low (< mean±SE)	%	Medium (< mean SE)	%	High (> mean±SE)	%
Banana chips	60	336	1	20	5.6±4.7	4	7	56	93	0	0
Potato chips	36	141	1	10	3.9±2.8	13	33	23	57	0	0
Jack fruit chips	38	114	1	10	3.0±2.6	5	13	33	87	0	0
Mixture	45	108	1	10	2.4±2.0	3	8	42	92	0	0
Murukku	29	84	1	21	2.9±4.5	4	14	4	14	21	72

The various fried items sold from Trivandrum city are presented in Table 29 which includes banana chips, potato chips, jackfruit chips, mixture and murukku. Out of 100 shops banana chips were sold from 60 shops amounting to 336 kg. per day; it recorded a mean rate of 5.6 kg. This was followed by potato chips and jack fruit chips (ie. 3.9±2.8 kg and 3.0 ±2.6 kg). However the sale of jack fruit chips was seasonal. These items were sold from 36 and 38 shops. (Out of 100 shops surveyed) A mean quantity of 2.9±2.8 kg and 2.9±4.5 kg of murukku and about 2.4±2.0 kg of mixture was sold in a day. The sale showed that mixture was sold from 45 shops and murukku was sold from 29 shops, out of 100 shops surveyed.

Distribution of shops based on the frequency of sale of fried items showed that maximum number of shops were in medium frequency of sale. Out of 60 shops that sold banana chips a

majority of 56 shops, belonged to medium frequency of sale (5.6±4.7 kg). In case of potato chips also a maximum number of 23 shops (57 per cent) out of 36 shops were in medium frequency of sale (3.9±2.8 kg). The distribution of shops based on sale of jack fruit chips and mixture also a majority of 33 shops and 42 shops (87 per cent and 92 per cent) respectively were in medium frequency of sale (3.0±2.6 kg and 2.4±2.0 kg) while only in the case of murukku, the majority of 21 shops (72 per cent) were in high frequency of sale.

It could be inferred that fried items are consumed at a higher rate. The reason for this may be that the teenagers are the frequent consumers of fried items. They believe that the fried item will give them extra energy and power. Another reason of purchasing the fried item in bulk is that these items have more shelf life than other bakery item. Fried item in general are appetising and they have appealing mouth feel ie. crispness and flavour which attracts young and old alike.

Table 30 Distribution of shops based on the frequency of daily sale of snack items

Food item	No.of shops from which the item is sold (n = 100)	Total Quantity sold (in number)	Range of the items amount of item sold (in number)		Mean±SE (in number)	Distribution of shops based on frequency of sale					
			Minimum	Maximum		Low (< mean±SE)	%	Medium (< mean SE)	%	High (> mean±SE)	%
Meat puffs	22	946	0	0	43±32	5	23	16	72	1	5
Sweet puffs	21	664	10	100	32±25	2	9	19	91	0	0
Vegetable puffs	25	845	10	100	34±27	3	12	22	88	0	0
Egg puffs	19	712	3	100	38±35	2	11	12	63	5	27
Cutlet	16	736	7	200	46±50	5	31	6	38	5	31
Samosa	20	716	10	100	36±30	3	15	17	85	0	0
Rusk	8	50 kg.	1	20	6.0±6.7	1	14	6	85	1	11
Vada	12	120	10	10	10±0	0	0	12	100	0	0

Table 30 indicates the various snack items sold from Trivandrum city. The snack items that were sold included meat puffs, sweet puffs, vegetable puffs, egg puffs, cutlet, samosa, rusk and vada. As indicated in the table from, 22 shops approximately 946 numbers of meat puffs were sold in a day; and it scored the maximum mean of 43± 32 numbers. Vegetable puffs and egg puffs were sold from 25 and 19 shops. They scored a mean of 34±27 and 38±35 numbers respecitvely. While the mean quantity of sale of sweet puffs was 32±25 numbers. The mean quantity of sale of cutlet was 46±50 number and that of samosa was 36±30 numbers. These items were sold from 16 and 20 shops respectively.

With respect to the frequency of sale of items like meat puffs, sweet puffs, vegetable puffs, egg puffs, cutlet, samosa, rusk and vada majority of shops were in the medium frequency level. It ranged from 38 to 100 percentage. Distribution of shops based on the sale of meat puffs showed that 16 shops (72 per cent) belonged to medium frequency level. (ie 43±32 numbers). In case of sale of sweet puffs and vegetable puffs, it was seen that 19 shops (91 per cent) and 22 shops (88 per cent) belonged to medium frequency level (ie. 32±25 number and 34±27 numbers). While distribution of shops based on the sale of vegetable puffs showed that a majority of 12 shops (63 per cent) belonged to medium frequency of sale.

With respect to frequency of sale of cutlet the table indicates that the shops were distributed almost equally in all frequencies ie 31 per cent (low), 38 per cent (medium) and 31 per cent (high). In case of samosa and vada distribution of shops showed that majority (of 17 shops (35 per cent) were in medium frequency of sale. (36±30 numbers). In case of vada, all the 12 shops belonged to medium frequency of sale.

From the above details it can be inferred that puffs and cutlets were sold to a greater extent than other snack items. This may be attributed to the fact that Indian prefer the masala taste of these items hence they buy it. This is in line with the observations of Raji (1992) who has stated that Indian prefer

highly spiced items. More over these items have good palatability and high satiety value, being rich in carbohydrate, protein and fat. At the same time they are not bulky in nature. Being shallow. fried items they offer pleasant flavour which attracts the consumer.

Table 31 Distribution of shops based in the frequency of daily sale of dairy products

Food item	No.of shops from which the item is sold (n = 100)	Total Quantity sold (in number)	Range of the items amount of item sold (in number)		Mean±SE (in number)	Distribution of shops based on frequency of sale					
			Minimum	Maximum		Low (< mean±SE)	%	Medium (< mean SE)	%	High (> mean±SE)	%
Ice cream	19	689	1	50	36±23	4	21	14	74	1	5
Milk powder	31	279 tin	1	3	9±15	3	10	8	26	20	65
Condensed milk	15	29 tin	1	3	2±2	9	60	6	40	0	0

Table 31 indicates the distribution of shops based on the frequency of sale of dairy products. Ice creams, milk powder and condensed milk were the various diary items, apart from toned milk most widely sold from the selected shops of Trivandrum city. About 680 cups (each of 125 ml capacity) of ice cream were sold from 19 shops out of 100 shops in a day and it recorded a mean of 36±23 cups. It was followed by milk powder with a mean of 9±15 tins (each of 500 mg) and condensed milk with mean 2±2 tins (250 ml per tin). Milk powder and condensed milk were sold from 31 and 15 shops out of 100 shops surveyed. It is of interest to note that only about 15 to 30 shops out of 100 shops surveyed in Trivandrum city were selling dairy products.

This also indicates that among the different categories of processed foods sold from the market, the dairy products could be ranked only at a lower level of sale. Though icecream was shown to be sold at a higher rate when sale is concerned it may be observed that it is sold only from 19 shops. This may be because of its highly perishable nature, and the need for cold storage facility which increases the establishment cost of the shops.

Distribution of shops based on the frequency of sale of icecreams showed that 74 % (14 shops) were in medium frequency level (= 36±23 number of ice cream cups). In case of condensed milk, out of 31 shops 20 shops were in high frequency level of sale (that is above 9±15 tins per day) while distribution of shops based on the frequency of sale of condensed milk showed that 9 shops (out of 15 shops) selling condensed milk were in low frequency level (less than 2±2 tins per day) of sale.

Ice cream was the dairy item which was sold at a higher rate compared to the other two dairy products. A survey on consumption pattern of milk and it products as reported by Catsberg and Kempen (1989) stated that 134.7 kg milk and milk products were cosumed per head in Netherlands. Thompkinson *et al*. (1995) stated the reasons of consuming milk powder. Socio economic condition, planning of mother's nutrition, rare physiological disturbance and fear of transmittable diseases are the main reasons of consuming milk powder. The children are fed

with these processed foods. Milk powder is also purchased as a whitener for tea and coffee which are mainly consumed by adults Punjrath (1995) stated that the key role that skim milk powder has played is that it equalizes seasonal milk flactuations. While Thompkmon (1995) stated that due to their keeping quality, non refrigerated storage requirements make milk products become more popular.

In case of ice cream the heavy users are both children and teenagers. It is an item that is most sought for, by them. Thompkinson (1995) reported that amongst the various dairy products, ice cream has a higher potential than its present condition. He has also added that children and teenagers were the frequent users of ice cream.

Table 32 Distribution of shops based on the frequency of daily sale of health drinks

Food items	No.of shops from which the item is sold (n = 100)	Total Quantity sold (in number)	Range of the amount of the item sold (in number)		Mean±SE (in number)	Distribution of shops based on frequency of sale					
			Minimum	Maximum		Low (< mean±SE)	%	Medium (< mean SE)	%	High (> mean±SE)	%
Horlics	19	36	1	14	2±4	4	21	15	79	0	0
Boost	34	68	1	14	2±4	2	6	4	12	28	82
Bournvita	30	78	1	14	3±5	2	7	1	3	27	90
Cerelac	32	64	1	7	2±4	2	6	4	13	26	81
Cornflakes	33	89	1	7	3±2	6	19	20	61	7	21
Ragavita	12	54	1	7	5±6	3	25	2	17	7	58

The various health foods/drinks sold from Trivandrum city consisted mainly of Horlics, Boost, Bournvita, Cornflakes, Ragivita and Cerelac. Among the different health drinks Boost was sold from 34 shops (out of 100 shops) and about 36 tins were sold in a day and it recorded a mean quantity of 2±4 packets. While Bournvita was sold from 30 shops and about 78 Bottles/refil packets were sold in a day from the selected shops of Trivandrum city.

In case of cerelac and cornflakes, they were sold from 32 and 33 shops and it recorded a mean of 2±4 and 3±2 tins respectively while ragivita was sold from 12 shops and it recorded a mean of 5±6 tins.

Distribution of shops based on the sale of Boost, Bournvita, Cerelac and Ragivita showed that majority of them were in high frequency level of sale. But in case of horlics majority of 15 shops (79 per cent) were in medium frequency of sale (2±4 tins). Distribution of shops based on sale of boost, bournvita and cerelac showed that 28, 27 and 26 shops (Out of 100 shops surveyed) were in high frequency of sale. In case of cornflakes a higher per cent of shops (61 per cent) were in medium frequency of sale while considering the sale of ragavita 7 shops (58 per cent) were in high frequency of sale. The over all picture showed that all the health foods/drinks are sold at a same rate. Children are the frequent consumers of these processed foods. Preferences in terms of taste, may be the main reason for higher consumption of health foods/drinks. Another

reason is that the parents are influenced by the mass media, and they think these foods are good for the health of their children.

Table 33 Distribution of shops based on the frequency of daily sale of other (miscellaneous)

Food item	No.of shops from which the item is sold (n = 100)	Total Quantity sold (in number)	Range of the items amount of item sold (in number)		Mean±SE (in number)	Distribution of shops based on frequency of sale					
			Minimum	Maximum		Low (< mean±SE)	%	Medium (< mean SE)	%	High (> mean±SE)	%
Ketchup	25	100	1	7	4±6	2	8	16	64	7	28
Noodles	10	80	1	30	8±15	2	20	8	80	0	0
Pickle	26	68	1	7	3±6	1	4	2	8	23	88
Jam	27	43	1	7	2±1	5	19	22	81	0	0
Sauce	14	35	1	7	3±2	5	36	9	64	0	0
Popcom	10	24	1	15	2±2	2	20	8	80	0	0
Samanti powder	30	90	1	6	3±3	2	7	28	93	0	0

From table 33 it can be seen that ketchup, noodles, pickle, jam, sauce pop corn and samanthi powder were the other processed items sold from different shops of Trivandrum city.

About 100 bottles of ketchup and 80 packets of noodles were sold from 25 and 10 shops respectively (out of 100 shops) of Trivandrum city. They recorded a mean sale of 4±16 bottles and 8±15 packets, per day. While 68 bottles of pickle and 43 bottles of jam were sold from 26 and 27 shops, with a mean of 3±2 bottles were sold from 14 shops (of the 100 shops surveyed).

Popcorn and samanthi powder were sold respectively from 10 and 30 shops, it recorded a mean sale of 2±2 packets and 3±3 packets.

Distribution of shops based on the frequency of sale of these items showed that majority of shops selling these item were in medium frequency. In case of noodles and popcorn a majority of 80 per cent of shops were in medium frequency level (8±15 packets and 2±2 packets). In case of samanthi powder 28 shops (out 30 selling it) were in medium frequency level of sale (3±3 packets) While in case of pickle the shops were in the high frequency range of sale (above 3±6 bottles per day) Sixty four per cent of shops selling ketchup and sauce were in medium frequency of sale (4±6 bottles and 3±2 bottles).

From the above table it is clear that ketchup, noodles, jam and pickle were found to be the common processed food consumed by the people of Kerala. Similar results has been reported by Anvita et al. (1993) who stated that jam and pickle were the most preferred processed food by the people of Punjab.

The above mentioned items are the newer products of the high tech-process industry, which came to India from western countries. Though the quantity sold may seen to be negligible from the point of view of bulk number of shops, the sale of above items, indicates a shift in the needs and preferences of the consumers of this city. The city is the capital of earstwhile

Travancore state, was known for its traditional gaity which was reflected in the food habits also.

The survey indicates a change away from traditional and customary style. This could be due to the rapidly growing trends of urbanisation with associated changes in the pattern of living and transportation. The preference for the above might have been induced by the audio-visual media primarily. The high literacy rate and the role played by the print media too cannot be ignored as secondary factors. The return of gulf repartiates, and the influence of non R.I.S. might have also helped to speed up the transition. Increase in the number of working women and their exposure to the public, and their need to save time and energy could also lead to a further leap in the use of such items.

From the inventory survey conducted among 100 shops to find out the availability and extend of sale of processed food it was found that 58 different bakery items were sold from them. And among the 58 items, 17 items were sold to a greater extend than other items. These items included cake, bread, biscuit, jelabi, laddu, carbonated beverages, fruit juice, banana chips, puffs, cutlet, ice cream, health drinks, jam, pickle, ketchup and noodles.

From the survey it was found that about 455 kg of plain cake was sold from the above shops in a day. In case of common

bread and biscuit about 587 loaf and 756 packets of biscuit were sold from Trivandrum city while in case of sweets about 2176 numbers of laddu, 2294 numbers of jelabi and 342 packets of groundnut sweets were sold daily. It was also inferred that on an average banana chips was sold to a higher extend (about 336 kg) than other fried items and chips.

The most frequently sold snack items were meat puffs and meat cutlet. It was found that 946 number of puffs and 736 number of meat cutlets were sold.

The various dairy items sold from Trivandrum city included ice creams, milk powder and condensed milk. Among these ice creams was found to be sold to a higher extend than the others. About 689 number of ice creams and 279 tins of milk powder were sold in a day.

Other items, that are sold at a higher rate included jam, pickle, ketchup and noodles. About 68 bottles of jam, 80 bottles of pickle, 100 bottles of ketchup and 100 packets noodles were found to be sold in a day.

From the 17 most frequently sold processed foods 11 items were selected for detailed analysis to find sanitary quality and adulterants in foods. The items selected included cake, biscuit, bread, ice creams, soft drinks, ground nut sweets, laddu, jelabi, milk and soda. These food items were subjected to

microbial analysis and chemical analysis to find sanitary quality of food and adulterants.

For the chemical analysis cake, biscuit, bread, ice creams, soft drinks, groundnut sweets, laddu, jelabi and milk were selected. And for microbial tests processed foods like milk, carbonted beverages, fuit juice, groundnut sweets and soda were selected.

4.3 Analysis to identify the microbial contaminants in selected processed foods through suitable microbial tests

Microbial analysis of selected processed foods (6 food items) was conducted, to find out whether these foods are contaminated with microorganisms to assess their sanitary quality.

The selected processed foods included icecream, groundnut sweets, fruits drink, fruit juice, soda and milk. These food items were purchased from 10 shops located in 15 different areas of the city, based on the details collected pertaining to quantity of items sold from the shops of the 15 area, through the market survey conducted earlier. The 15 different areas of the city included East Fort, Medical College, Ulloor, Sasthamangalam, Peroorkada, Pattoor, Palayam, Statue, Overbridge, Bakery junction, Kesavadasapuram, Sreekariyam, Pettah, Vazhuthacadu and Thampanoor. Sampling for the microbial

analysis of individual item was done according to ISI specification.

The result of microbial analysis of the different food item are given below.

4.3.1 Microbial analysis of milk sample

Milk samples were subjected to microbial analysis to find the total bacterial count and the presence of coliforms, as specified by ISI, vide IS 13688, 1992 (ISI, 1992).

For the analysis samples were collected only from 3 areas namely East Fort, Peroorkada and Medical College. Only 3 milk samples were selected for analysis as the pasterurised milk is distributed in Trivandrum city from the same dairy unit. The sampling was done according to procedure given in IS 11546:1985.

The result showed that the milk samples were free from coliforms. And the total bacterial count was 26,000/ml which was present to be below the standard specified by ISI, of 30,000/ml (maximum).

4.3.2 Microbial analysis of fruit drinks and fruit juice sample

Fruit drinks and fruit juice samples were tested for the presence of coliforms and bacterial count. For this purpose 10 samples each of Fruit drink and Fruit juice samples were

collected from East Fort, Medical College, Ulloor, Thampanoor, Vazhuthacadu, Overbridge, Bakery junction, Pattoor, Pettah and Peroorkada. The sampling technique for the microbial analysis has followed as per IS 13019 : 1991 (BIS, 1991).

The result showed that the all the samples were free from bacteria and especially coliforms.

4.3.3 Microbial analysis of ice cream samples

Ice cream samples collected from East Fort, Ulloor, Medical College, Sasthamangalam, Pettah, Statue, Thampanoor, Vazhuthacadu, Overbridge and Bakery junction were subjected to microbial analysis to find presence of Salmonella and Staphylooccus. Apart from this coliformis and the total bacterial count were also found according to IS 2802 : 1964. Sampling of the material for the microbial analysis was done as per the procedure described in IS 2802 1964 (ISI 1964). The result showed that all the samples were free from microorganisms.

4.3.4 Microbial analysis of soda

Soda samples collected from Thampanoor, East Fort, Bakery Junction, Statue, Peroorkada, Sastamangalam, Overbridge, Kesavadasapuram, Pettah and Pattor, were tested for the presence of coliforms. The results showed that all the samples were free from coliforms.

4.3.5 Microbial analysis of ground nut sweets

ISI (1989) has specified that groundnut sweets should be free from staphylococus, Salmonella and Coliforms and fungi. ISI has also specified that total bacterial count of groundnuts weights should not exceed 50000 g and the count of yeast should not exceed 10/g. Accordingly the samples were tested for the above. For the analysis samples were collected from East Fort, Ulloor, Medical College, Statue, Thampanoor, Pettah, Pattom, Vazhuathacaud, Bakery junction and Palayam. Samples were collected analysed according to the procedure prescribed in IS 6287 : 1985.

The results indicated that the samples were free from sallmonela, Staphylococcus, coliformis, yeast and fungi.

From the above results of microbial analysis of 6 food items it can be inferred that the quality of all samples were good. This may be because of the efforts taken by PFA acts and rules Governmental organisations. According to Prevention of Food Adulteration Act of 1954 (PFA) an article shall be deemed to be adulterated, if the articles has been prepared, packed or kept under insanitary conditions whereby it has become contaminated or injurious to health.

Anon (1990) claimed that BIS has laid down a code of hygiene (IS 8123 : 176) for the stalls selling cut fruits, fruit

salads and fruit juices. The microorganisms including the bacteria and fungi are frequent contaminants in foods. Murray (1993) stated that a vast array of microorganisms including bacteria and fungi enter into foods and produce toxic metabolites. These microorganisms enter into food through soil, water, air, animal insects, processing and packaging equipments or from humans involved in food processing and preparation and consumption of infected foods leads to many illness. However, the results of the detailed microbiological evaluation of the samples to evaluate their sanitary quality revealed that the all the commonly sold and consumed food items tested, were free of microbial contamination. This may done to the fact that these items have been prepared, packed, and sold under strict sanitary conditions, and hence may be consumed with safety.

4.4. Analysis of the composition and identification of adulterants in selected processed foods through chemical analysis

Chemical analysis of the composition of selected processed foods (9 food items) was conducted to identify the presence of adulterants and to find out, if they confirm to the standards prescribed by Indian standard Institution/Bureau of Indian standards.

From the household as well as market survey conducted in the intial part of the study it was found that foods such as

jelabi, laddu, bread, biscuits, cake, icecream, groundnut sweets, fruit drinks and fruit juice were the most commonly purchased and consumed items. Hence these samples were subjected to chemical analysis. The sample for analysis were purchased from 10 shops located in 15 different areas of the city based on the details collected pertaining to quantity of items sold from the shops of the 15 area, through the market survey conducted earlier. Thus the food item listed above were purchased from 10 areas such as East Fort, Medical College, Ulloor, Sasthamangalam, Peroorkada, Pattor, Palayam, Statue, Overbridge, Bakery junction, Kesavadasapuram, Sreekariyam, Pettah, Vazhuthacadu and Thampanoor.

The sampling was done according to ISI specification. The results of chemical analysis is given in following pages.

3.4.1 Analysis of bread samples

ISI has specified certain requirements for bread vide IS : 1483-1988 (BIS 1989). As per the specification the bread samples were tested for the total solid content, pH, acid insoluble ash and crude fibre. For this bread samples were collected from selected shops of East Fort, Ulloor, Medical College, Statue, Thampanoor, Pettah, Overbridge, Bakery Junction, Palayam and Pattor, since the maximum quantity were sold from these three retail outlets of Trivandrum city. The test was conducted according to the method prescribed by IS : 1483-1988 (BIS 1989)

and the average (mean) of the values obtained for each test are given in Table 34.

The sampling was done according to procedure given in IS 1483-1988 (BIS 1989).

Table 34 Average value of requirement specified by ISI for bread

Sl.No. of samples	Total solid content (requires 60)	pH of the bread (required:5-6)	Acid insoluble ash	Crude fibre
1	65	5.06	0.09	0.45
2	69	5.2	0.10	0.40
3	75	5.10	0.08	0.50
4	68	5.2	0.07	0.30
5	72	5.50	0.09	0.40
6	79	5.60	0.09	0.45
7	80	5.20	0.10	0.50
8	62	5.20	0.07	0.25
9	65	5.6	0.06	0.30
10	65	5.3	0.065	0.25
ISI standard	60 % (min)	5.6	0.1 (max)	0.5 (max)

Table 34 shows that the bread samples were upto the standard prescribed by IS : 1483-1988 (BIS, 1989). ISI has specified the requirement of total solids with minimum 60 per cent and all the samples had total solid content ranging between 62 and 72 per cent. The pH of bread sample varied from 5 to 6, which was within the range specified by ISI.

Acid insoluble ash content of the 10 samples of bread were also within the requirement. The specified crude fibre content is 0.5 per cent by mass and all tested samples had the crude fibre content below the maximum value specified by ISI. It ranged from 0.3 to 0.5 per cent. While Chandran (1995) reported the crude fibre content of bread was 0.28 per cent and that of ash was 2.88 per cent.

3.4.2 Analysis of cake samples

Chemical analysis was carried out to find the adulterants in cake samples. ISI has specified the quality requirements of cake vide IS 9712-1981 (ISI 1981). For this cake samples were collected from East Fort, Medical College, Ulloor, Thampanoor, Pettah, Pattoor, Sreekariyam, Vazhuthacadu, Bakery Junction and Palayam. Since these areas had maximum sale with respect to the above item. Sampling was done according to IS : 1483-1979. (ISI 1981).

The samples were tested for moisture per cent, acid insoluble ash and acidity of extracted fat according to the procedure specified by IS 9712-1981. The test was carried out in three replications and the average values are given in Table 35.

Table 35 Average value of requirement specified by ISI for cakes

Sl.No.	Moisture	Acid insoluble ash	Acidity of extracted fat
1	19.2	0.08	0.99
2	16.6	0.07	0.80
3	19.5	0.10	0.70
4	21.6	0.06	1.0
5	21.7	0.0751	0.9
6	19.8	0.08	0.89
7	17.1	0.082	0.67
8	16.5	0.09	1.0
9	16.7	0.07	0.9
10	22.3	0.091	0.92
ISI Standard:	15.25 %	00.1 % (max)	1.0 % (max)

Test result showed that all the cake samples were upto the standard specified by ISI. The moisture percentage ranged between 16.2 to 22.3 per cent, acid insoluble ash ranged betweed 0.06 to 0.1 per cent. Moisture is one of the important parameters which determine the shelf - life quality of any food product. Most stored products are considered to be safe in storage at a particular moisture content, low moisture is highly important for longer storage period. In case of acidity of extracted fat content, the ten samples, were in confirmity with the standard ie 1.0 per cent. The acidity of extracted fat

content ranged from 0.67 to 1 per cent. The over all picture indicates that the cakes sold from the selected shops confirmed to the quality parameters stipulated by ISI.

4.4.3 Analysis of biscuit samples

Ten biscuit samples collected from different areas of Trivandrum city were tested for its composition. For this samples were collected from East Fort, Ulloor, Medical College, Statue, Thampanoor, Pattom, Sreekariyam, Vazhuthacadu, Bakery junction and Palayam. The areas were selected on the basis of sale of biscuits in Trivandrum city. The sampling was done according to ISI 12741:1989 (BIS, 1992).

ISI has specified the requirements for biscuits to maintain quality vide IS 1011 : 1992 (BIS 1992). The samples which does not confirm to the standards specified are to be deemed as adulterated. The samples were tested for moisture percent by mass, acid insoluble ash and acidity of extracted fat. The test was carried out in three replications. The average value of moisture %, acid insoluble ash and acidity are given in Table 36.

Table 36 Average value of the requirements specified by ISI for biscuit

Sl.No.	Moisture	Acid insoluble ash	Acidity of extracted fat
1	4.6	0.05	1.0
2	4.6	0.045	7.9
3	6.8	0.03	1.0
4	4.3	0.02	1.0
5	5.0	0.02	0.9
6	4.6	0.05	0.9
7	4.5	0.02	1.0
8	5.0	0.05	1.0
9	4.5	0.05	1.0
10	4.3	0.03	0.8
ISI Standard	5.0 % (max.)	0.05 % (max.)	1.2 % (max.)

The results of chemical analysis of biscuit samples, showed that all the samples, confirm to the requirement for biscuit as specified by ISI as follows : moisture per cent by mass 5.0 per cent (maximum), acid insoluble ash 0.05 per cent (maximum), and acidity of extracted fat 1.2 per cent (maximum).

The moisture content of the tested samples ranged from 4.3 and 5.0 case of acid insoluble ash the range was between 0.02 to 0.05 per cent while the acidity of extracted fat was between 0.9 and 1.0 per cent.

Khara et al. (1995) had reported that the samples of biscuits that they analysed had a protein content of 11.99 fat 24.2 and had a fibre content of 0.5 per cent. Which was found to be of good quality. However the values obtained for moisture content of biscuit as reported by Kent and Evero (1994) was 15 per cent, which was much above the desirable value. However the ash content of 0.4 per cent was found to be within the prescribed limit. High moisture content would affect the keeping quality of biscuit.

4.4.5 Analysis of jelebi and laddu samples

Jelebi and laddu are widely consumed sweet item in India (Potty 1990). ISI has specified that jelebi and laddu samples should not contain artificial colourants other than tartrazine and sunset yellow FCF as per their stipulations vide SP 18:1981. (ISI 1981). The jelabi and laddu samples were subjected to chemical analysis to test for the presence of adulterants in the form of additives. For the analysis samples were collected from 10 selected areas of Trivandrum city. The areas selected were East fort, Ulloor, Medical College, Peroorkada, Statue, Thampanoor, Pettah, Pattor, Bakery junction and Palayam. These areas were selected because these sweet items were sold at a higher rate from these areas than other areas of Trivandrum city.

The samples were tested for artificial sweetners and colourants in accordance with the method prescribed by ISI vide SP 1981 (ISI 1981). The above tests were conducted in three replications.

The result showed that all the laddu and jelabi samples were free from adulterants in the form of artificial sweetners and colourants. Only the permitted colourant Tartrazine in the case of laddu and sunset yellow FCF in the case of jelabi were found in the samples. Since the shops had declared the fact that the sweets are not made in ghee, the tests for fats were not conducted to find out whether such forms of adulteration exists or not, since it was irrelevent. Organoleptic evaluation also proved that the samples were not made in ghee, other wise the materials were acceptable and had good quality.

From this it could be inferred that the two sweets available in the market were of good quality. It should be noted that though the samples were collected from 10 different areas of Trivandrum city none of the samples were adulterated. This may be one of the reasons why laddu and jelabi were sold to a higher extend than other sweets.

The people of Kerala are highly educated and they are aware of the quality of the foods. If they are in doubt about the quality of a particular food item, they would go in for another food, rather than buying the item of low quality.

Another feature of the consumers is that they are ready-to-buy good quality foods at any cost, hence there is no need for the food producers to use low quality additives in food inorder to attract the consumers. There are many studies in which it is reported that artificial colourants and sweetners are added to sweets. Chengappa and Chindanand (1989) in their study conducted in Utter Pradesh found that every third sample of colourful sweets such as jelabee, burfee and toffee contained prohibited dyes.

Raman (1989) opined that Jelabi, Halwa, Laddu and Burfee in which artificial colourants are used, may cause cancer. Babu and Indushekar (1990) reported that some sweets contained non permitted colours used for dyeing goods that are toxic to humans and those which are reported, caused cancer in experimental rats. According to the World Health Organisation, the acceptable daily intake of saccharine is 2.5 mg per every kilogram of body weight. In India, formerly, saccharine was permitted for all foods but its use is now limited to carbonated drinks with declaration on the label. But it continues to enjoy immense popularity amongst roadside sweetmeat sellers, owing to its low cost and low calorific value (Girimaji, 1987).

However the traditional food samples of jelabi and laddu, purchased from the shops of Trivandrum city were found to be of good quality. They were found to be unadulterated with

respect to artificial colours and sweetners especially the harmful non-permittted coal-tar dyes, including dyes used for colouring textile and the carcinogenic sweetner, especially saccharin and dulcin.

4.4.6 Analysis of icecream samples

Ice cream is a widely consumed food and is a recognised medium to help increasing the milk intake. ISI has specified the quality requirements of ice cream vide IS : 2802 - 1964 (ISI, 1964). The ice cream samples were subjected to chemical analysis to find the adulterants in it. For the analysis ten samples were collected from 10 selected areas of Trivandrum city. The areas selected were East Fort, Ulloor, Medical College, Sastamangalam, Peroorkada, Statue, Thampanoor, Vazhuthacadu, Overbridge and Bakery junction. These areas were selected because ice creams were sold at a higher rate from these areas than other areas of Trivandrum city, where the survey was conducted. The samples were collected according to procedure specified by IS : 2802 - 1964 (ISI, 1964).

The samples were tested for total solids, milk fat, acidity and sucrose content according to the methods prescribed by IS 2802-1964 (ISI, 1964). Apart from these tests, the samples were also tested for the presence of artificial colourants, sweetners, total sugar and starch content of the samples. The

analytical method specified in SP 18 : 1981 (ISI, 1981) was followed in testing the presence of the above items.

The tests were conducted on replicate samples and the average (mean) of the values obtained for each tests are given in Table 37.

Table 37 Average value of the requirements specified by ISI for icecreams

No.	Artificial colour	Artificial sweetner	Cane sugar %	Total sugar	Starch	TS %	Protein %	Milk fat (%)	Acidity %
1	-ve	-ve	18.1	22.7	-ve	38.4	*3.3	11.1	-ve
2	-ve	-ve	14.5	19.0	-ve	40.1	3.9	12.6	-ve
3	-ve	-ve	14.5	18.4	-ve	37.1	3.9	10.1	-ve
4	-ve	-ve	13.8	17.7	-ve	36.3	3.7	10.1	-ve
5	-ve	-ve	14.8	19.7	-ve	39.1	3.8	11.5	-ve
6	-ve	-ve	14.1	22.1	-ve	38.4	3.5	12.0	-ve
7	-ve	-ve	14.5	19.6	-ve	40.0	3.9	10.5	-ve
8	-ve	-ve	18.9	19.5	-ve	37.1	*3.2	11.1	-ve
9	-ve	-ve	13.1	22.5	-ve	36.9	3.7	12.5	-ve
10	-ve	-ve	14.9	22.7	-ve	38.5	3.8	11.6	-ve
ISI Standard									
	-ve	-ve	12	17	-ve	36	3.5	10	-ve

The result showed that all the ten samples were free from artificial colourants, artificial sweetners and starch.

Usually artificial colourants and sweetners are added to ice cream to improve cosmetic value as reported by Khanna (1986), Chengappa and Chindanand (1989), had stated that synthetic colourants are used in milk and non-milk products, sugar and confectionary and it makes the most important form of adulteration. Sinha (1988), after scanning the Food Adulteration Journal, published during the years 1984-86, reported that 64 per cent of the cases of food adulteration were in terms of non-permitted food colours and 36 per cent of such cases were in respect of illegal use of saccharin in the ice candy and beverages. However in the present study such items were not found in any of the samples tested. This indicates that these items were of good quality.

The total solid content of ice cream as specified by ISI is 36 percentage (minimum) while the total solids of 10 samples ranged from 37.1 to 40.1 per cent. The milk fat content ranged between 10.1 to 12.6 percentage, which was upto the standard of 10 per cent (minimum) prescribed by ISI.

In the case of cane sugar content of the ten samples, it ranged from 13.1 to 18.9 per cent against the prescribed level of a minimum of 12 per cent. The prescribed level of total sugar for ice cream is 17 per cent (minimum) and all the samples were upto the prescribed standard.

The protein content of icecream is prescribed as 3.5 percentage as the minimum level. The result showed that only 8 samples were upto the standard, while 2 samples were deficient in protein. Similar study was reported by collumb et al. (1992), in which it was stated that low fat content in dairy products is a form of adulteration.

4.4.7 Analysis of fruit drinks

ISI has specified the quality requirements for fruit drinks that are sold in the market. Accordingly fruit drinks were tested for the presence of artificial colourants, sweetners, Bromulated vegetable oil, total solids and acidity. This was carried out on the basis of the procedure specified by SP 18 : 1981 (ISI, 1981). For this samples were collected from East Fort, Medical College, Ulloor, Thampanoor, Vazhuthacadu, Overbridge, Bakery junction, Pattor, Pettah and Palayam. These areas were selected on the basis of the quantity of fruit drinks sold per day. Triplicate samples were analysed for confirmative results. The average value obtained for the test is given in Table 38.

Table 38 Average value of the requirement specified by ISI for fruit drinks

Sl. No.	Artificial colourant present	Artificial sweetner	B.V.O.	Acidity	Total soluble solids (%)
1.	Sunset yellow tartazine carmoisine	-ve	-ve	-ve	15.7
2.	Sunset yellow tartrazine	-ve	-ve	-ve	*6
3.	Ponceauar sunset yellow	-ve	-ve	-ve	12.4
4.	Sunset yellow	-ve	-ve	-ve	13.7
5.	Tartrazine sunset yellow	-ve	-ve	-ve	10.9
6.	Sunset yellow carmoisine	-ve	-ve	-ve	10.8
7.	Sunset yellow	-ve	-ve	-ve	12.6
8.	Ponceauar sunset yellow	-ve	-ve	-ve	13.1
9.	Tartrazine sunset yellow	-ve	-ve	-ve	12.8
10.	Sunset yellow	-ve	-ve	-ve	10.8
ISI	Standard	-ve	-ve	-ve	10 %

Table 38 shows the results of the chemical analysis of fruit drinks. The result showed that all the samples were free

from artificial sweetners, colourants (other than the one permitted) and Bromulated vegetable oil (B.V.O.). The samples also showed negative for acidity test.

But in the case of total solids all the 9 samples were upto the standard specified (ie 10 per cent), while only one sample was below the standard specified by ISI.

Crivaro and Faberro (1992) reported the presence of Food colour yellow FCF (E 110) in fruit juices and fruit based soft drinks. Rajan (1987) revealed the findings of the Technology research centre in which it was cited that out of 12,576 samples of food stuffs anaysed, 8,820 were found to be adulterated with food colours, which were banned by the Government.

Anon (1990) reported that B.V.O. is not carcinogenic and is allowed in U.S. but the use is allowed only to 15 ppm. But the monopolies and restrictive trade practices, commission in its investigation of the soft drinks, noted that the studies in the US had shown that the use of BVO even in the case of 0.5 per cent causes growth retardation, impared food assimilation, slight amnesia and enlargement of heart. While Anon (1991) stated that aspartame, the artificial sweetner used in cola and many other products may diminish appetite.

4.4.8 Analysis of groundnut sweet samples

ISI has specified certain requirements for groudnut sweets vide IS 7592 : 1989. (BIS 1989). Accordingly groundnut sweet samples were tested for moisture (per cent) protein (per cent), fat content, acid-value of extracted fat, and insoluble ash and total sugar. For the chemical analysis groundnut sweets were collected from 10 different areas of Trivandrum city. On the basis of the sale of the item. The areas selected for sample collection included East Fort, Ulloor, Medical College, Statue, Thampanoor, Pettah, Pattor, Vazhuthacadu, Bakery Junction and Palayam. Groundnut sweets are sold at a higher rate from these areas compared to other areas of Trivandrum city, where the survey was conducted. The samples were collected according to procedure prescribed in IS 6287 : 1985 (BIS 1989).

The above tests were conducted in three replications, and the average values obtained for each tests are given in table 39.

Table 39 Average value of the requirement specified by ISI for groundnut sweets

Sl. No.	Moisture, % by mass	Protein, % by mass (on dry basis)	Fat,% by mass (on dry basis)	Acid value of extracted fat (on dry basis)	Acid insoluble ash (on dry basis) % by mass	Total sugars as sucrose % by mass
1	2.5	12.5	12.5	1.2	0.09	32.2
2	5.0	13.0	12.2	2.0	0.07	29
3	4.8	12.8	12.0	1.8	0.07	39
4	5.0	12.0	13.0	1.5	0.08	35
5	4.5	13.5	12.8	1.0	0.1	32.8
6	2.8	13.0	12.2	1.2	0.08	30
7	2.5	13.1	12.3	1.5	0.07	35.2
8	5.0	12.0	12.8	1.8	0.09	32
9	4.2	12.5	13.0	1.2	0.08	29
10	5.0	12.8	2.2	1.8	0.1	32
ISI standard						
	5.0 % (Max.)	12 % (Min.)	12 % (Min.)	2 % (Max.)	0.1 % (Max.)	40 % (Max.)

The results showed that all the groundnut sweet samples were free from adulterants. The maximum moisture per cent specified by ISI is 5.0 per cent and the results showed that for all the ten samples the moisture per cent were below the standard of 5.0 per cent.

In case of protein and fat the specified limit is 12 % (minimum) and all the samples were upto the standard.

The acid value of extracted fat ranged from 1.0 to 2.0 per cent while acceptable value is 2.0 per cent. The acid insoluble ash content ranged from 0.07 to 0.1 per cent. While specified range is 0.1 per cent. Total sugar content of all the samples analysed were also upto the standard specified by ISI (minimum 40 per cent). These values showed that groundnut samples were of good quality.

4.4.9 Analysis of milk samples

Milk is one of the most important commodity that is required every households as an article of food (Anon 1990). Processed milk sold from the central dairy was found to be the most commonly used processed item sold in Trivadrum city and is widely consumed by the city dwellers.

ISI has specified certain requirements for pasteurized milk vide IS 13688 : 1992 (BIS 1992). Milk samples were subjected to chemical analysis for finding the adulterants in it. For the chemical analysis three samples were collected from East Fort, Peroorkada and Medical College, since the maximum quantity were sold from the three retail outlets of Trivandrum diary. It should be noted that only three milk samples were selected for analysis as the pasteurized milk is distributed in the whole Trivandrum city from the same diary unit. The samples were selected according to the procedure prescribed by IS 11546:1985 (ISI 1985).

The samples were tested for milk fat and milk Solid-Not-Fat (SNF) according to the method prescribed by IS 1479 (Part 2) 1961 (BIS, 1992). Apart from this specific gravity was also tested. This was carried out according to method prescribed by Chaudhuri (1959). The test was carried out in three replications. The average specif gravity is given in Table 40.

Table 40 Average value of the requirements specified by ISI for milk

Milk sample	Specific gravity	Milk fat (%)	Solid not-fat (%)
1	1.0320	3.1	8.51
2	1.0325	3.0	8.61
3	1.0323	3.1	8.51
ISI Standard	1.032	3.0	8.51

The result showed that the milk fat content ranged from 3.0 to 3.1 per cent while the prescribed limit was 3.0 per cent similar study was carried out by Kumar et al. (1992), in which it was reported that the fat content of toned milk was 3.0 per cent. This indicates that the milk sample had the fat content upto the standard prescribed by ISI.

The required Solid-Not-Fat content of milk as specified by ISI is 8.5 per cent. It was found that all the three samples

were upto the standard as the limit prescribed was 8.5. Arora et al. (1992) has also stated that the SNF of cows milk ranged from 8.0 to 8.5 per cent. The specific gravity of the three samples ranged from 1.0320 to 1.0325. The specified range for pasterurized milk as per ISI was 1.032. Specific gravity of milk was found, inorder to check whether water is added to it. There are many reports supporting it. Harding (1991), Lidong (1992) reported that water is added usually to milk, and this forms the most important form of adulteration of milk. From the above results we can infer that the milk samples were free from adulteration.

The above results of chemical analysis to find the composition and adulterants in selected processed foods revealed that the samples were free from adulteration. However two ice cream samples and a fruit drink sample were not upto the standard specified by ISI. But the over all picture showed that the quality of processed food available in the market of Trivandrum city was good.

Through this study entitled "Sanitary quality and adulterants in selected processed foods" an attempt was made to find out the contaminants and adulterants found in most commonly consumed processed foods, so as to assess their quality.

The results showed that all the samples, comprising bread, biscuit, cake, jelabi, laddu, fruit drinks, fruit juices,

ice creams, soda, milk and groundnut sweets, each being selected from 10 different areas of Trivandrum city, were subjected to chemical and/or microbial analysis, based on quality attributes specified by ISI, were found to be free from, contaminants and adulterants.

In a nut shell this reflects the fact that only products that have good quality are sold from the shops of Trivandrum city in larger amounts or that the products that are sold in larger amounts are those which satisfies the consumers of Trivandrum city and therefore are being purchased by them. The frequency of purchase and use of such processed food items by the consumer also indicates the same, though quantity sold per day per shop may not indicate a bulk sale. They only indicate the trend with reference to the sale from the point of view of the shop keepers as well as the preference of the consumers. Hence it can be deduced from the above study that only those items that have 'quality' are preferred by the consumers or only that item having quality are sold in larger quantities from the shops compared to other items. It also reveals that the items of quality are preferred by the city dwellers of Trivandrum, with respect to the tested items and they move out in larger numbers from the shelves of the shops. Thus a conclusion has been arrived from the fact that the items selected for the study were of good quality though they were selected on the basis of quantity, sold from the shops located in different areas of the

city, which also reflects the preference of a cross section of the consumers of Trivandrum city. If the qua tity of the items were poor these items would not have been sold to such extend.

The fact that the products selected and tested are of good quality is a matter of pride to the consumers as well as to the shop keepers of Trivandrum city. There are several factors which might have contributed to the availability of quality products from the selected shops of Trivandrum city, leading to the sale as well as consumption of the same.

Economic level of the city dwellers might be considered as a factor that might influence the purchase of quality products. Only well off people would buy most of the above item except soda or milk on a regular basis. Mathias (1971) found that with higher and regular income, the consumption pattern of the family changes in quantity and quality.

As income increases, the purchasing power also increases. This increased purchasing power would help people to "pick and choose" items that are available. This would help them to go for quality products. It is a universal fact that improvement in quality demands enhances the cost. Despite the slight exalation in the cost, the rich would go for quality products, if it is at their disposal. The results leads to the fact that if these items did not have quality, the consumers

would go to purchase other foods, rather than buying an item that has poor quality.

In this context it may be observed that the city dewellers, who go in for the purchase of these foods are those who are economically better off than the rural poor of Trivandrum city. According to 1991 census it was revealed that the percapita income of Trivandrum city (dweller) is 2080 Rupees, which is higher when compared to districts like Kazargod, Kannur, Kozhicode, Malapuram, palghat, Trissur, Kottayam and Alapuzha or those in the rural areas of Trivandrum district. Hence this might have been one of the reasons for obtaining quality products from the shops of Trivandrum city.

The income (economic status) of family is directly influenced by the employment of family members, and the literacy rate. The higher income level of the people of Trivandrum could be due to better employment status. The employment status of the district is quite high. It is reported that 36.86 per cent of the people are employed. It is high when compared to other districts like Kollam, Pattanamthitta, Alapuzha, Kottayam, Ernakulam, Malapuram, Kozhicode and Kanooor. More over in the city there are more Government employees who have a steady income.

There are more families with both husband and wife or more than one member in the family also are employed. All this

increases the purchasing power, and their capacity to purchase quality products. Moreover employment exposes the people to the community, outside their own neighbourhood. It also opens out a ways for better interpersonal communication. This also entails them to greater awareness. This gives them greater opportunity to know the quality products, how to identify quality products, and places from which such products are available.

Thus high employment could be one of the factors that would have helped people to go for quality products. Moreover the employed homemakers were found to purchase more of processed foods as they are involved in multifaceted activities within the house (Chellammal 1995). When the need is enhanced, and when it is impounded with better income provided by employment would eventually lead to purchase of quality products.

Kerala is known for its achievement in literacy. The average rate of literacy is 90.59 for Kerala and that of Trivandrum is 89.2 (Nair, 1991) and that of rural and urban areas are 88 and 91.57 (Government of Kerala, 1991). The high literacy rate of the people, make them more proficient to choose foods. They may be aware of the quality parameters of foods and will be more concerned about sanitation and hygiene, which would ensure quality in one way or other. The high literacy and education of the people, especially that of women would have played a role in helping them to select quality products which alone were found to

be sold from the shops. People who are aware of the benefits of quality, with respect to their health benefits will not purchase items of poor quality. According to Basu (1993) literacy is universaly recognised as a powerful instrument of social change. True education inculcates rational thinking and results in improved behaviour effected through conviction rather than compulsion or coercion. When education brings about the desirable change, the nations' aspirations for a better quality of life can be realized (Kerala Profile 1984). Anvita et al. (1993) stated that less educated respondents give more preference to taste and more educated respondents gave more preference to qualities of nutritious input, list of ingredients and freshness of the product. Anon (1990) has also stated that more educated people check the sanitary quality of foods when they purchase it.

The women of Kerala have some unique features compared to their counterparts in other states. Kerala is the only state were women dominate men in number. The sex ratio of Kerala according to the 1991 census is 1036 as against the national figure of 927. The female literacy rate in Kerala is (86.13) also above the national rate of 39.29 (Resia Beegum and Sarangadharan 1994). Nair (1991) also stated that Kerala leads the other parts of the country in women's education. The literacy rate of women in Trivandrum is 77.72%. This implies that education of home makers provided better job prospects, that increased family income. This makes women economically

independent (Girija 1995). While Oza (1987) reported that education of the working mother as well as that of the head of the family increases the level of family income and the money spent on food. The major objective of education should be to help people to help themselves. Thus it influences the home makers in purchasing good quality foods. They will be choosy about quality foods. Literacy rate is also related to exposure to mass media. Fatimabi (1993) stated that the exposure to mass media is influenced by young age, higher education and socio economic status.

Though food habits are more appropriately governed by traditional and family backgrounds. They are subjected to winds of changes due to stress of modern living. People prefer to buy packed food rather to buy unpacked items. Jayalekshmi (1991) claimed that in the developed countries, the consumers are well educated about their choices and selection of goods and services. Hence it is natural that the people of Kerala, who exhibit sophistication with respect to hygiene and sanitation and cleanliness go out to choose quality products and use them in their meal pattern.

Mass media plays an important role in educating the consumers. News papers, magazines, radio and TV are constantly involved in disseminating information about health, or about consumer problems and issues. The same medium also publishes

information on different types of commodities available in the market and their quality. Such information serves as an important instrument for the decision making of the consumer (Anon 1990). Through advertisement in mass media help people to convey the importance of quality foods. The common man, of Kerala is a ardent reader of newspaper, specially to popular ones in these vernacular, and his reading habits are well known. This also might have helped them to choose quality products. Another major role, mass media plays is that it bring forth the hazards of adulteration; and publish it in news papers, hence the produces are much aware of selling quality foods. They are afraid that if the product has no quality it will lead to business failure and money loss. Hence the shop keeper also go four quality products to fill their shelves.

Government has also taken a major role to present "Food Adulteration. There are food standards set by Government. They are ISI. FPO and Agmark. This ensures quality for foods (Anon 1989).

The Government has enacted food laws which help the consumers in selecting and purchasing quality foods. PFA rules and acts are enforced to prevent adulteration. Jacob (1979) stated that prevention of food adulteration acts and rules are designed to eradicate the manace of food adulteration and to ensure the purity of food articles. The food inspectors who

frequently visit the shops collects samples to check to their quality. In Kerala there are 14 District Food Inspectors appointed as local health authorities to supervise the work of the Food Inspectors. There are three mobile vigilance squads working in Kerala. The activities of Food Inspectors, in both urban and rural areas, are evaluated by the Deputy Director of Health services (Thampuran, 1985).

There are three analytical laboratories, which are concerned with the analysis of food samples and water samples for the whole state. More than 15,000 samples are analysed every year in these three laboratories (Government of Kerala, 1990). According to health profile of Kerala published by the Government of Kerala (1990) about 10486 samples were collected and 251 samples were found adulterated and prosecution procedures have been launched in 208 cases.

According to Sen Gupta (1988) standards prescribed under PFA act, 1954 are the minimum standard and are mandatory. Violation of PFA rules 1955 and non-confirming to the standards prescribed in punishable by law. A person found guilty of adulteration is death with in accordance with section 16 of the PFA act of 1954. In general the punishments are

1. Minimum punishment of 6 month imprisonment which may extend upto 3y with a fine of not less than Rs.1000/- in case of adulteration of non-injurious nature.

2. When adulteration is of injurious nature the punishment can rise to imprisonment for 6y with a fine not less than Rs.2000/-.

3. If an article of food when consumed is likely to cause death or harm to the body, imprisonment can be extended upto life with a minimum fine of Rs.5,000/-.

Awareness about these rules by the literate man of Kerala, as well as the shop keepers also might have helped to the sale of quality of products. The latest development in the field of consumer rights is the proposed setting up of consumer protection cells at different levels (Anon, 1930). They are sponsored by the Central Government and the State Governments. Under this scheme there will be a committee at district level to which a consumer can appeal if he feels he is decieved by a seller of the community. Such committees are set up at state and national level. These have been given statutory powers and hence enjoy legal status.

The extension agencies of the Governments like the departments of health, Food, Agriculture, Social welfare educate the consumers from time to time on various aspects of foods. All these Governmental machineries help consumers to purchase good quality foods. This may be the reason for the low incidence of food adulteration and the availability of quality products in Kerala.

SUMMARY

SUMMARY

The study entitled "Sanitary quality and adulterants in selected processed foods" was conducted to identify the contaminants and adulterants found in most commonly consumed processed foods through chemical and microbial evaluation.

The study at its outset comprised of two independent surveys to identify the most commonly sold and consumed processed foods in Trivandrum city. The identified food materials were subjected to quality evaluation through microbial and chemical analysis.

The surveys conducted among selected 100 households in Trivandrum revealed that the majority of the subjects were Hindus living in urban pockets with nuclear type of family. Sixty eight respondents of these families, who were women, were employed and 92 had been married and had been leading a family life for more than 10 years and they were all moderately educated.

The average income of the respondents ranged between Rs.1000 to 2500 per month out of which 500 to 2000 rupees were spent on food.

Out of the 100 families surveyed 95 per cent of the respondents reported that they purchased and consumed processed foods from local bakeries and they spent about 50-500 rupees for purchasing processed foods.

Cake, bread, bun, fried items, sweets, jam, pickle, biscuit, puffs and squash were the common processed food items consumed by these households. It was found that these items were purchased mostly from local bakeries and were consumed at least once in a week.

The survey indicated that 73 per cent of them purchased processed foods as they helped to save time in cooking. The main disadvantage of buying processed foods, as pointed out by the consumers was that the consumption of processed foods may cause diseases.

Enquiry on the concepts of the respondents about the problems of food adulteration, revealed that majority of the respondents were aware of the hazards of adulteration and the need for sanitary handling of food. They had basic awareness about the quality parameters that need to be looked into while purchasing processed foods.

From the inventory survey conducted among 100 shops to find out the availability and extend of sale of processed foods, it was found that 58 different processed foods were sold from them. Among the 58 items 18 were sold to a greater extend than other items. These items included cake, bread, biscuit, jelebi, laddu, carbonated beverages, fruit juices, banana chips, puffs, cutlets, icecreams, health drinks, jam, pickles, ketchups milk and noodles.

From the above 18 most frequently sold processed foods, 11 items were selected for detailed study. The other 8 items were excluded because these products were packed and labelled factory products; they also possess 'quality marks'. These foods might have been subjected to quality testing before release into the market as per the P.F.A. rules.

Thus 10 items such as cake, biscuits, bread, icecream, soft drinks, groundnut sweets, laddu, jelabi, milk and soda were subjected to evaluation of quality standards on microbial load and composition employing the criteria and procedures specified by ISI standard. The samples for the analysis were selected from 10 different areas of the city, based on quantity of the item sold per day. However pasteurised milk was collected only from 3 areas, since, pasteurised milk was distributed from different outlets were processed from the same central dairy.

The result of microbial analysis to find contaminants in food items such as icecreams, fruit juices, fruit drinks, groundnut sweets, milk and soda collected from 10 different areas revealed that all the samples were free from microbial contamination.

Analysis of composition to check whether the food samples confirmed to the standards specified by ISI, revealed that all the foods samples were free from adulteration. However two ice cream samples and a fruit drink samples out of 10 samples

each tested were not upto the standard specified by ISI. The fat content of 2 ice cream samples and total solid content of fruit drink were below the standard specified.

Thus the study revealed that the items sold in abundance, from the shops and most frequently used by the consumers of Trivandrum, were found to be of good quality when examined from the point of quality attributes specified by ISI. The shop keepers as well as the consumers of Trivandrum can be proud of the fact that in locally processed food items are of good quality. It may also leads to the fact that only the items of quality are being selected and consumed by the consumer of Trivandrum.

REFERENCES

REFERENCES

Abdul Hameed. 1995. Mercury in fish, prawn and lobsters from the inshore waters of Kayal patnam (Gulf of mannar) : *Pollution Research* **14**(1): 27-36

Abdussalam, M. and Kaferstein, F.K. 1993. Food safety in primary health care. *World Health Forum* **4**(15): 393

Achaya, K.T. 1993. Seminar on Indian sweets. *Indian food Industry*. May-June **12**(3): 22

Albert Daniel, K. 1971. *Bakery : material and method*. Mac lawn and Sons : 177 - 184

Ananthanarayan, R. 1991. *Introduction to Medical Microbiology*. Orient Longman. Madras 1-25

Anon. 1987. *The Prevention of food Adulteration Act 1954 and PFA rules 1958*. Army Educational Stores, New Delhi.

Anon. 1989. Convenience Food. *You and your Food* **4**: 29

Anon. 1990. Protection, Safety and consumer education. *Economics of Foods*. Indira Gandhi National open University **3**: 1-23

Anon. 1991. Research round up : Kits for detecting adulterated food. *Indian Food Industry* May-June. 39

Anon. 1993. Trends in fruit based ingredients. Asia and Middle *East Fast trade*. **10**(3): 19

Anon. 1996. Convenience food. *Indian Food Industry* **14**(2): 15

Anvita, S. 1988. Food additives : a critical evaluation of regulation and enforcement mechanism in India. *Indian Food Packer*. **42**(1): 59-72

Anvita, S., Mathur, P. and Mehrotra, N.M. 1993. A study of consumers attitude towards processed foods. *Indian Food Packer* **47**(2): 12

Archer. 1991. The adulteration of white pepper with rice starch. *Food Science and Technology Abstract*. **26**(1): 11

Arora, K.L., Gupta, V.K. and Rajorhia, G.S. 1992. Standardisation of a method for T.S. determination in flavoured milk. *Journal of Dairy Food and Home Science* **11**(1): 10-12

Arya, S.S. 1987. Role of food additives in convenience foods. *Indian food Industry*. **6**(1): 11-14

Babu, C.J. 1981. *Pesticides Research and Development* II. Roussel Pharmaceuticals (India) Ltd. New Delhi : 121

Babu, S. and Indushekar, S. 1990. Methods for distinguishing food colours from textile colours. *Beverage and Food World* 11(2): 20

Bass, M.A., Wakefield, L., Kolasa, K. 1979. *Community Nutrition and individual food Behaviour*. Burgers Publishing Company. Minnesota. 156

Basu, S.N. 1993. Health status of tribal women in India. *Social change*. 23(4): 19

Beegum, R.M. 1991. In A *textbook of foods, Nutrition and Dietitics*. Sterling publishers Private Limited. India pp: 157-172

Barath Bushan, Reddy, B., Kohlinga Reddy, Y., Ranganadham, M. and Padmanabha Reddy, V. 1994. Bacteriological quality of ice cream marketted in Tirupathi. *Journal of Food Science and Technology*. 31(2): 151-152

Bhattacharya, R.K. 1980. Current status and further outlook of food grain processing industry in India. *Journal of Food Science and Technology*. : 1-16

Bhattarchargee, J.W. 1989. Microbial contaminants of food. *Proceedings of 2nd Indian convention of food scientists and technologists*. 19-20 Feb 1981: 43

Bhavani, J. and Sen. A.K. 1992. Standardisation of Pesticide. *Indian Food Industry*. 14(2): 18-22

BIS. 1989. *Peanut chikki (Candy) : Specification*. Bureau of Indian Standards, New Delhi

BIS. 1992. *Pasteurized milk : specification* Bureau of Indian standards. New Delhi

Biswas, G., Sarkar, S. and Challeyee, T.K. 1994. Survillence on artificial colours in food products marketted in Calcutta and adjoining areas. *Journal of Food Science and Technology* 31(1): 66-67

Bradshaw, J.G., Peeler, J.T. and Twedt, R.M. 1991. Thermal resistance of *listeria sp* in milk *Journal of Food Protetion* **4**(12): 14

Brookes, S.T., Barrie, A. and Davis, J.E. 1992. Determination of corn syrup in honey. *Food Science and Technology Abstract* **24**(12): 12-19

Catsberg, C.M.E. and Kamplen, G.J.M. 1989. *Food Handbook*. Ellis horwood. Singapore

Charles, C.F. and Kaln, R.L. 1968. *The hand bbook of social psychology : Research methods*, second edition, Amerind Publishing Co. Pvt. Ltd.: 204-206.

Chaudhary, A.C. 1959. *Practical dairy Science and laboratory methods*. Scientific book agency, 103 Netaji Subhash Road Calcutta : 20-21

Chandran, J.C. 1995. Improvement of the nutritional qualityof bread. *M.Sc. (FS&N) Theis* (Unpublished) submitted to KAU, Vellayani.

Chellammal, S. 1995. Developing complementary food products based on cassava and sweet potato. Ph.D. (FS and N) Thesis (Unpublished) submitted to KAU, Vellayani.

Chengappa, R. and Chindanand, R. 1989. Poison in your food. *India Today*. June 15 : 74-83

Chorltan, P. 1987. 'Food poisoning'. *Womens special Report* U.K. Publication July 10

Collins, C.H. and Patricia. M..L. 1976. *Microbial methods* 4th Edn. Butterworth and Co. Pub. Ltd. London

Collumb, M. and Spahni, M. 1992. Adulteration of dairy products. *Food Science and Technology Abstract*. **24**(7): 60

Consumer Guidance Society. 1987. Food facts, fads and fallacies. *News Time*, July 18

Corkish, J. 1988. "Consumer problems, who cares?" *New Home Economics*. **34**(2): 5

Crivaro, N.O. and Feberro, N. 1992. Method for determining colourants in fruit juices. *Indian Food Packer*. **42**(2): 377-391

Defco Manual. 1977. Dehydrated culture media and reagents for microbiological and Clinical lab procedures. Defco laborotories U.S.A.

Devadas, R.P. 1972. In : *Food adulteration and contamination, Nutrition in Tamil Nadu*. Madras. Madras Institute of development studies. pp: 87-88

Diaz, S.M. 1987. For the forgotten consumer of India the time has come, Indian Express. March 22:6

Dixit, C.V. 1989. Consumers Don't take things lying down. *Social welfare* **10**(16): 10

Doyle, M.P. and Padhya, V.V. 1989. *Escherichia coli In Food Born Bacterial Pathogens*. Doyle, M.P. ed. Marck Dikker, New York pp. 235-282.

Express New Services. 1987. Pesticides traces in food stuffs increasing. *Indian Express* May 10. 11

Fateh Singh. 1989. Convenience foods. *Indian food Industry*: **6**(1): 11-14,

Fatimabi, P.K. 1993. Welfare schemes for agricultural labourers. A multi diamensional analysis. M.Sc (Ag.) Thesis (Unpublished) submitted to KAU.

Fernandy, C. 1990. Why advertise baby food. Times of India. May 14 : 25

Ferwick, G.R. 1983. Determination of papaya seed adulteralum of Black pepper. *Journal of Food Science* **5**(1): 129

Fox, C. and Cameron, Y. 1990. Food security. *Journal of Food Science*. **4**(2): 28.

Frazier, W.C. 1967. *Food Microbiology*. Mc graw hill Co. Sydney

Ganesh Kumar, C. and Singh R.S. 1994. Yersinia enterocolitica as an emerging food borne pathogen a review. *Indian Journal of Dairy Science* **47**: 537-544

Gaur, K.D. 1993. Consumers, adulteration of foods and drugs. *In consumer Protection and Legal control* ed. Leelakrishnan. P. New Delhi : Eastern Book Cop: 267

Gayathri, M. 1988. *Food and Nutrition*. Naveen Gupta Publishing house, New Delhi : 242-261

George, G. 1988. The Importance of Oral Rehydration Therapy in the control of Diarrhoea in the coastal areas of Trivandrum District. *M.Sc. (FS and N) Thesis submitted to KAU, Vellanikkara* (unpublished).

Giri, J. 1979. Evolving techniques for quantitative estimation of adulterants in food stuffs. *Indian Journal of Nutrition and Dietetics*. 16(3): 42

Girija Devi, L. 1995. A survey on food adulteration in Trivandrum city. *Doctorate in phylosophy. Thesis* (Unpublished) submitted to Kerala University

Girimaji, P. 1988. Dire dye - False colours. *Express Magazine*. July 5

Goyle, A. and Dugar, N. 1993. Quality evaluation of three canteen snacks. *Indian Food Packer* XLVII. 5

Government of India 1993. *Economics and Statistics*. Department of Economics. Kerala Agricultural University, Vellayani

Government of India. 1990. *Health Profile*. Kerala. Department of Health and Family Welfare. 62-65

Government of Kerala 1995. Published by Government of India.

Grewal, J.S. and Tiwari, R.P. 1990. Microbial quality of Rasmalai. *Journal of Food Science and Technology* 27(3): 178-179

Grifort, F., Barrie, A. and Lucena, F. 1987. Microbiological and hygiene control campaign for ice ream. *Food Science and Technology Abstract*. 2(1): 124

Guitiman, P.J. and Gorden, W.P. 1982. In : *Marketing Management Strategies and programmes.* Mc Graw Hill International Book. Co : pp 54-67

Guraya, H.S. and Toledo, R.T. 1993. Determining getalinised starch in a dry starchy product. *Journal of Food Science* : **58**(4): 888

Gupta, P.S. 1988. Food laws of the country and consumers participation. *Indian food packer* **42**(6): 38-41

Gupta, V.P. 1993. "Air cooking oils safe?". Bombay : *Financial Express*. Nov. 6:7

Handa, S.K. 1992. *Monitoring of pesticide residues in Indian environment.* Namrutha Pub. Madras : 22

Harding, F. 1991. Milk adulteration. *Food Science Technology* Abstract. **26**(9): 26

Haridas Rao, P. 1993. Recent developments in the use of shortening and sufactants in bread making. *Food industry*: 9(3): 28-32

Hooker, P.K. 1988. Food industry. Scenario. *Indian Food Industry*. **15**(1): 29

Health profile, Kerala. 1990. Department of Health and Family Welfare. Government of Kerala.

ISI. 1964. *Specification for ice cream.* Indian Standard Institution. New Delhi

ISI. 1981. *Specification for cakes*. Indian Standards institution. New Delhi

ISI. 1983. *Indian Standard : specification for Jelabimix*. Indian Standards Institution. New Delhi

ISI. 1985: *Sampling technique - specification*. Indian Standard Institution. New Delhi

ISI. 1992. *Biscuits - specification*. Bureau of Indian Standards. New Delhi

Iyer, V.N. 1992. Safety precautions in the manufacture and handling of pesticide. *Pesticide Management and pesticides, Indian Scenario*. Namrutha Publications. Madras. p. 336

Jacob, T. 1979. *Food Adulteration*. The Mac Millan Company of India. India : p 1-88

James, M.J. 1986. *Modern Food Microbiology*. Popular Book Dept.

Jawahar, A.T. and Jayachandran, P. 1994. Studies on micro organisms associated with Prawn Pickle. *Journal of Food Science and Technology* **31**(2): 165-167

Jayalekshmi, L. 1991. *Consumer Protection and Education*. Unpublished paper

Joshua, A.K. 1988. *Food Microbiology*. Popular Book Depot, Madras

Jonnes, M. 1988. Food poisoning. *New Scientist*. 1612(118): 28

Ju, C.C., Chan, W.L. and Lin, C.W. 1991. Studies on detection of reconstituted milk in raw and pasteurised milk through determination of milk. *Food Science Technology Abstract*. **23**(12): 28

Kacew, S. and Singhal, R.L. 1980. *Aspects of molicular mechanisms underlying the biolchemical toxicology of lead. In lead toxicity*. Boltimore. Munich pp 43-78

Kapur, O.P. and Nagaraja, K.V. 1987. Metallic food contaminants. *Proceedings 2nd Indian convention of food scientists and technologists*. pp 51

Kalra, L. and Armbruster, G. 1987. *Quantity food sanitation* : John wiley and Sons, Canada : 193

Kamp. S. 1986. Perceived quality of food products and its relation to consumer prefererence. Theory and Management. *Journal of Food Quality*. **9**: 373-86

Kaur, T. 1988. :Health Hazards of food additives" *NPICCD. Newsletter*. March-April, **8**(4): 3

Kent, N.L. and Evero, L. 1994. *Technology of cereals*. Pregamon Press. Braunschveig

Khanna, S.K; Srinivastava, L.P. and Singh, G.B. 1986. Comparative usage pattern of synthetic dye in yellow to orange coloured eatables among city and rural markets. *Indian Food Packer* : **5**: 33

Khanna, S.K., Upreti, K.K. and Singh, G.B. 1987. A comparitive study on the pattern and magnitude of adulterantion of food stuffs during two decennial survey terms. *The Indian Journal of Nutrition and dietitics* : **24**: 310-318

Khara, S.K., Krishna, J. and Sinha, L.K. 1995. Preparation and nutritional evaluation of Okara fortified biscuits. *Journal of dairying foods and Home Science*. **14**(2): 91-94

Kotia, P.K. and Sharma, N.K. 1986. Consumer protection - a myth. *Yojana*. July 15. 30

Kulkarni, P.R. 1990. Detection of adulteration of spice poppy seeds with *Amaranthus paniculatus* (rajgeera) seed. *Journal of Food Science* : **2**(11) : 129

Kumar, S., Tyagi, S.M., Chauhan, G.S. and Verma, N.S. 1992. Effect of fat level in milk, Type of coagulants and coagulation temperature on the textural characteristics and organoleptic quality of Rasogolla. *Journal of Dairy, Food and Home Science* **11**(1): 13-20

Leelakrishnan, P. 1983. *Consumer protection and legal control*. Eastern Book Company, Lucknow : 3.

Lidong, F. 1992. Food quality control. Adulteration of farm milk in China. *Food lab news* **8**(1): 39-42

Lipp, J. Ziegler, H. and Courady, E. 1991. Detection of high fructose and other Syrup in honey. *Food Science Technology Abstract* **23**(3): 35

Mahadeviah, M. and Rowramma, N. 1987. Metal contamination. Indian Food Industry. Mar-Apr: 29.

Mahadeviah, M. 1990. Metal containers for packing processed food products : Present status and future prospects in India. *Indian Food Industry* : Jan-Feb. 33

Malayala Manorama. 1995. *Manorama Year Book* 1994. Kottayam : 633

Manay, N.S. and Shadasharaswamy. 1987. *Food facts and principles*. New Delhi. Wiley Eastern Ltd. 437-468

Maria, F.V. 1989. Food consumption and energy expenditure pattern of employed home makers in organised sector in Trivandrum. *MSc (FS and N) Thesis* (Unpub.) KAU, College of Agriculture, Vellayani

Mathan. P.K. 1987. Half kilo coal in one rice. *Trivandrum Manorama Daily*. July 5

Mathias, M. 1971. The impact of industrialisation and urbanisation on food consumption pattern in developing countries. Ref. India *Proceedings of 1st Asian congress of Nutrition*. NIN: Hyderbad pp. 742-750

Mathur. N. 1993. Food technology Scenario. *Indian Food Industry*. 11(6): 26

Mazumdar, V 1979. *'Research to policy' rural women in India. In surdra Zeirelensteen status : In family planning.* 10(11-12): 357

Mc Curdy, A.K. and Salivaras, M. 1993. In *Food Flavours ingredients and composition*. Edt. George Charalambous. EL Sevien Amsterdan London : 279-300

Melvin, R.J. 1980. FDA. good manufacturing practice regulations. *Journal of Food quality*. **3**(1980): 109-118

Milburn, P. 1989. Food adulteration. *Journal of Food Quality* **2**: (1989). 102-112

Mishra, R.K. 1991. "Are you getting your money's worth?" *Indian Express*. March 12:

Murray, C.J. 1993. Zoonotic origins of human Salmonellosis in Australia. *Dairy Food Environmental Sanitation* **13** : 458-461

Nagammal, K. 1989. Impact of ragi based food supplement on the nutritional status of selected preschool children. M.Sc. (FS and N) Thesis (Unpublished) submitted to KAU, Vellayani.

Nair, M.K.C. 1995. *Why Kerala should invest in mother and child nutrition and development*. A paper presented in Mother and child nutrition symposium.

Narasinga Rao, B.S. 1990. Contaminants and food additives. *Indian Food Industry*. July-Aug: 14-15

Narayanaswamy, S. 1990. Role of Government agencies in consumer protection. Ahamadabad. *Consumer Confrontation* **10**(4): 31-33

Naseema Beevi, S., Mathew, T.B., Vishalakshi, A., Ashari, P.R. and Dale. P. 1991. Organochlorine insecticide in milk and milk powder in Kerala. *Paper presented in nation symposium of survalance prevention and control of food contaminants*. CFTRI. Mysore. Dec : 3-5. 1991. Abstract Proceedings: 13

Neelakanta, C.B. 1989. Consumer exploitation, How and Why? *Social Welfare*. **35**(12): 21-26

Oleimann, C. and Beden, J.W. 1983. A sensitive HPLC method of detecting and estimating rennet whey total solids in Skim milk powder. *Netherlands milk and Dairy Journal* **37**(1): 26-36

Oza, B.N. 1987. Role of education within and over generation. *Journal of Rural development* **6**(3): 314-323

Parent, R. 1984. Studying of the nutritional habits of pupils at a secondary school in Pontedera. *Journal of Canadian Dietitic Association* **43**(4): 358-365

Philip, T. and Raheena, K. 1989. In. *Vanitha* Oct. 1-14: pp. 56-57

Potter, Y. and Mansel, P. 1990. Food processing *Journal of Food Science*. **10**(1): 161

Potty, V.H. 1990. Trends in food consumption and food industry development - A global perspective. *Indian food Industry*. **14**(4): 36

Prema, L. 1989. A report on hazards of food adulteration in Trivandrum district. Vellayani : Kerala Agricultural University

Przybyla, A.E. 1991. Improved methods to detect adulteration of fruit juice. *Food Science and Technology Abstract* **23**(2): 78

Punjrath, J.S. 1995. Milk products *Indian Food Industry* **14**(15): 62

Puri, R. and Sanghera. T. 1987. Nutritive value and consumption pattern of processed foods. *Indian Food Packer*. May-June:

Quiogue, E.S. 1970. Comparison weighing and interview methods in food consumption surveys. *Philippine Journal Nutrition* **23**(2): 18-37

Rajan, G. 1987. Beware of poisonous colours. *Social welfare* **34**(6): 37-38

Raji, 1992. Food Adulteration. *Vanitha* Aug 1-14 pp. 26

Riji Hari, 1995. Developing partially dehydrated pineapple products using solar drier. *M.Sc. (FS and N) Thesis* (Unpublished) submitted to KAU, Vellayani.

Rajalekshmi, R. 1974. *Applied Nutriton*. New Dehlhi. Oxford and IBN Publishing Co. 287

Raman, M. 1989. Health hazards. *Vanitha* Aug 15-31: 32-33

Resia Beegum, S., Sarngadharan, M. 1994. Women enterepreneurship in Kerala. *Yojana*. June 15. 29

Rhodehamel, E.J. Reddy, N.R. and Pierson, M.P. 1986. Growth of Staphylococcus Aureus S-6 and Yersenia entero colitica CDCA 2635 in cow, soy and winged bean milk. *Journal of Food Quality* **9**(1986) : 387-398

Rognerud, G. Malt Erud and H. Boe, L. 1983. Consumers attitude towards bread consumption. *Food Science technology Abstract*. **1984**(9): 269

Sajid Hussain, Sastry, G.S.R. and Prasada Raju, N. 1989. Detection of foreign oil adulteration in coconut oil by size exetersion chromatography. *Food Technology Abstract* **24**(5) : 389

Sajilatha, M., Nayak, R.R., Singhal, R.S. and Kulkarni, P.R. 1994. Microorganisms as indices of food quality. *Beverage and Food World*. March - 1994 : 9

Salivaras, C. and Mc Curdy. 1993. Adulteration of olive oil with cheap oils. *Journal of Food Science*. 12(1): 3-48

Sampathu, S. R., Krishnamoorthy, N., Shivasankar, S., Shankaranarayanan, R., Sreenivasa Rao and Lewis, Y.S 1981. Natural food colours. *Indian Food Packer*. **35**(2): 97-105

Sarkar, D. 1989. Food poisoning through Indian dairy products. *Beverage and Food World*. **22**(3): 7

Sastry, K.P. 1987. Protecting consumers interest. *Yonjana* **30**(27): 15

Seidemann, J. 1993. Adulteration in pepper. *Journal of Food Science* 11(1): 23

Sen Gupta, P. 1988. Food laws of the country and consumers participation. *Indian Food Packer*. Nov-Dec. 38-41

Sharma, R.N. 1995. Quest for Quality in food sector : Role of standards. *Indian Food Industry* **14**(6): 52

Sankar, P. 1992. Consumption pattern of processed foods. *Indian Food Industry*. **15**(1): 62

Singh, B. and Shewpalackar, S.R. 1989. Studies on ready mix for Kheer. *Journal of food Science and Technology* **26** : 12

Sinha, Anvita. 1988. Food additives : a critical evaluation of regulation and enforcement mechanism in India. *Indian Food Packer* **42**(1): 59-72

Smith, W.H. 1972. *Biscuits crakers and cookies*. Technology production and management. Division of management for Industry. Inc.

Sobti, R. 1988. Food adulteration - The consumers responsibility. *Health for the millions*. **14**(5): 17-20

Sohrab. 1995. ISO 9000 and food industry. *Indian Food Industry*. **14**(2): 34

Soni, K., Jindal, B.R. and Arora, D.R. 1986. Effect of employment of housewives on the interaction pattern. A study in rural and urban Ludhiana. *Journal of Research Punjab Agricultural University*. 23(1): 136-142.

Srinivasan and Veena, B. 1982. Home Makers attitude towards selected marketing practices and consumer responsibility and its influence on actual buying pratices *Indian Journal of Home Sciece*. **14**(4): 22-23.

Stern. N.J. and Kazmi. S.U. 1989. *Compylobacter Jeyveni* Marcle Dekku New York pp : 235-282

Sudhir Singh, S.K. Khanna and Shivashraya Singh. 1996. Impacts of Environmental pollutants : Contaminas to and adulterants in Ensuring Food safety. *Indian Food Industry*. **15**(1): 29

Sumati, R.M. and Salini, R. 1991. Carbonated drink. *Food Science* Wiley Eastern limited. India

Sundharam, S. 1990. Consumer Protection Facts for you. **11**(10): 27-43

Sundhari, V. and Kamalanathan, G. 1968. The use of labour saving kitchen devices in relation to the time management of selected urban home maker. *The Indian Journal of Home Science* **2**(2): 87-89

Swaminathan, M. 1974. *Essentails of Food and Nutrition*. Madras Ganesh and Company. 2-139

Swaminathan, M. 1991. In *Food and Nutrition*. The Bangalore printing and publishing Co Ltd. Mysore Road. Bangalore. pp: 439-452.

Tawfick, Y.S., Robert, B.B. and Barry, G.S. 1981. Dilution and solids. Adultertion of apple juice. *Journal of food quality* **5**(1981): 59-72

Thampuran, B. 1985. Prevention of food adulteration. *Janapatham*. Septmeber - October : 2-6

The international commission on microbiology 1980. *Microbial ecology of foods*. Vol II. Academic Press New York: 292

Thomas, K., Chitrakala, S. and Philip, E. 1989. Oral rehydration therapy in childhood diarrhoea a comparitive study. *Indian Proceedings* **15**(10): 7-19

Thomas, T. 1970. In *Consumerism - An opportunity for industry market management and the Indian Economy* Vikas Publishing House Pvt. (Ltd. pp: 297-318

Thompkinson, D.K. 1995. Dairy Industry in India: A scenario *Indian Food Industry*. **14**(2): 18-22

TNVHA. 1994. Newsletter. 3 : July-Sept. pp 8. 12

Turner, A. 1998. A technologist look at additives: Food manufacture *Journal for food and drink industries*. July 61 (7):

Venkataraman, K. and Anandavalli, M. 1995. Heavy metal pollution at Tuticorin coast. *Pollution Research*. **14**(2): 227-232

Visalakshi, A., Naseema Beevi, S. and Mathew, T.B. 1991. Pesticide residue in bovine milk. *Environmental Biology* : **14**(3): 225-229

Wald, B. and Galensa. 1990. Detection of adulteration of apple juice and pear juice. *Food Technology Abstract* **25**(3): 213

Wehlan, A. 1989. Keeping food safe, Food Technology in New Zealand. *Journal of the Printpack - net food analysis* **24**(9): 16

Wendy, S. and David, B. 1987. *Food poisoning and food hygiene* Edward Arnold. London : 177

WHO. 1987. Principles for the safety assessment of food additives and contaminants in food. *Environment Health Giteria*. 70 : 86

Wiliam, J.S. 1983. *The Pastry chef* AVI Pub. Comp Inc. West port Connecticut: 289

APPENDICES

APPENDIX - I

Questionnaire for collecting data on the use of processed foods among households

PART - I

Socio economic status of the respondents

1. Name of the respondent:
2. Address:
3. Religion/Caste:
4. Occupation:
5. Area of residence: Urban:
   Rural:
6. Occupation: Part time:
   Full time:
7. Type of family: Extended
   Nuclear
8. Marital status: Unmarried:
   Married:
   Widow:
   Deserted:
   Divorced:
9. Years after marriage: Below 5 years:
   5-10 years:
   Above 10 years:

10. Details of the family:

Number	Relation to the respondent	Sex M	Sex F	Education qualification	Job	Income

11. Total number of persons in the family:

12. Number of children in the family

Age	Sex M	Sex F	Number
0 - 6 months			
7 - 12 months			
Children 1 - 3 years:			
4 - 6 years:			
7 - 9 years:			
10 - 12 years:			
13 - 15 years:			
16 - 18 years;			

13. Total number of adults: M F

Total

14. Family income:

15. Respondent's income:

16. Expenditure (total):

17. Food Expenditure (Monthly):

18. Does any body help in doing household work: Yes / No

19. If yes, write whom:

    1.
    2
    3.

20. Does any one help in kitchen: Yes / No

21. If yes, write whom, and in what all activities

	Chopping/ cutting	Grind- ing	Cook- ing	Clea- ning	All acti- vities
Husband					
Mother					
Son					
Daughter in law					
Somebody else					

22. Write whether any of the work simplifying device is present at home

    1. Mixie
    2. Solar cooker
    3. Milk cooker
    4. Bread toaster
    5. Rice cooker
    6. Gas stove
    7. Electric oven
    8. Hot case
    9. Wet grinder
    10. Micro wave oven
    11. Food processor
    12. Cooking range
    13. Any other device

PART - II

Questionnaire for collecting details of use of purchase of and processed food

1. Do you purchase processed food: Yes:

   No:

2. If yes, the expenditure on purchase food/month:

3. Details pertaining to the purchase of processed foods:

Name of the item	Made at home	Purchased from shop	Use of items/ daily use	Time of the use (Morning-night)

4. Details pertaining to use of processed foods

Item	Purchased item (Please tick)	From where it is purchased					How many times				Amount
		Bakery	Super Market	Petty shop	Provision store	Else-where	Daily	Weekly	Monthly	Some-time	Never	Amount purch-ased each time
Cake												
Fried items												
Bread/Bun												
Toffee												
Sweets												
Jam												
Pickle												
Babyfoods												
Biscuits												
Soft drinks												
Ice cream												
Cutlet												
Puffs												
Juice												
Squash												
Other items												

5. (a) Does anybody help in preparing processed foods: Yes / No

(b) If yes, whom?

Husband
Mother
Daughter
Son
Servant
Daughter-in-law
Anybody else

6. State the reason why you purchase processed food (Please tick)

(a) Saves time
(b) Tasty
(c) Doesn't know to make
(d) To show prestige
(e) Variety
(f) Longer shelf life
(g) Children's interests/likes
(h) Children's need
(i) Nonavailability of device
(j) Profitable
(k) Can by in bulk
(l) Insufficient space in kitchen
(m) Any other reason

7. Advantages of using processed foods

8. Disadvantages of using processed foods

Part III

Knowledge of the respondents on sanitary quality and adulterants in foods

1. According to you, what is food adulteration

2. Disadvantages of adulteration of foods

3. From your experience which of the following are adulterated to a greater extent

   a. Processed foods

   b. Un processed foods

4. What are the ways employed to prevent food adulteration?

5. (a) Do you know the ways/means to find food adulteration in foods

   Yes / No

   (b) If yes, give details

   (c) Item - Adulterant Method to detect adulteration

6. Do you check the quality of processed foods while purchasing it?

   Yes/No

7) While purchasing processed foods do you check for the following qualities of foods

   a) Packed / Bottled / Tinned foods

Qualities	Yes / No	Method employed to ensure quality
Freshness		
Colour		
Amount/weight		
Appearance		
Expiry date		
Manufacturing date		
Quality marks		

List of ingredients

Brand name

b) Loose food item

Freshness
Colour
Appearance
Ingredients
Manufacturing date
Any other

8. Do you purchase processed foods from outside

a) Yes/No

b) If yes, what are the food items purchased, and from where they are bought

Item	Hotel	Bakery	Festival ground	Thattukada	Others
Toffee					
Cake					
Sweets					
Soft drinks					
Ice cream					
Cutlet					
Puffs					
Others					

(9) Does your children buy processed foods from outside?

a) Yes / No

b) If no, why?

c) If yes, from where they bought it?

Item	Hotel	Bakery	Festival ground	Thattukada	Others
Toffee					
Cake					
Sweets					
Soft drinks					
Ice cream					
Cutlet					
Puffs					
Others					

10 Do you check for the following sanitary quality of food while purchasing it?

Quality	Yes / No
1) Dirt/Dust and stones in food	
2) Whether available in packed form	
3) Cleanliness of packed food	
4) Whether deteriorated food is sold	
5) Cleanliness of surrounding place	
6) Whether flies are present in selling place	
7) Cleanliness of salesman	
8) Whether served with hands or not	
9) Whether decayed substances are sold	
10) Whether displayed foods are kept closed	

APPENDIX - II

COMPOSITION OF MEDIA

1. Peptone Glucose Extract Agar Medium

Beef extract	-	3 g
Peptone	-	5 g
Agar	-	15 g
Water	-	1 l

2. Lactose Broth

Beef extract	-	3 g
Peptone	-	5 g
Bile salt	-	1 g
Lactose	-	5 g
Water	-	1 l

3. Nutrient Agar Medium - 1 l

Beef extract	-	0.038
Peptone	-	5 g
Agar	-	15 g
Water	-	1 l

4. Mac - Conkey Agar Medium

Neutral red	-	0.038
Crystal violt	-	0.001 g
Peptone	-	20 g
Lactose	-	10 g
Bile Salt	-	1.5 g
Sodium chloride	-	5 g
Agar	-	13.5 g
Water	-	1 l

5. Staphylococous medium

Yeast extract	-	2.5 g
Peptone	-	10 g
Gelatin	-	30 g
Lactose	-	2 g
Manmitol	-	10 g
Sodium chloride	-	75 g
Disodium phosphate	-	14 g
Agar	-	15 g
Water	-	1 l

6. Malt Extract Agar Medium

Yeast	-	5 g
Malt	-	10 g
Glucose	-	4 g
Agar	-	20 g
Water	-	1 l
pH	-	4-5

7. Peptone dextrose agar with Rose Bengal and Streptomyces

Peptone	-	5 g
Dextrose	-	10 g
Pottasium dihydrogen phosphate	-	1 g
Magnesium sulphate	-	0.5 g
Agar	-	15 g
Streptomycin	-	13 mg
Rose Bengal	-	1 part in 30000 parts of medium
Distilled water	-	1 l

APPENDIX - III

Average sale of processed foods

Items	East Fort (12 shops)	Ulloor (8 shops)	Medical College (9 shops)	Sastha-mangalam (5 shops)	Peroor-kkada (12 shops)	Statue (6 shops)	Thampa-noor (7 shops)	Pettah (4 shops)	Patoor (6 shops)	Sreekariyam (4 shops)	Vazhu-thacadu (6 shops)	Over bridge (7 shops)	Bakery Junction (4 shops)	Palayam (5 shops)	Kesava-dasapuram (5 shops)
CAKE ITEM (kg)															
Plain cake	6.7	4.12	4.30	2.0	3.75	1.8*	4.7	5.5	3.7	4.50	6.0	3.5	9.75**	5.4	3.0
Fruit cake	3.5	4.12	3.80	4.0	0.90*	1.6	4.28**	1.75	2.3	4.00	5.0	2.1	3.00	4.2**	2.0
Plum cake	3.3	2.50	3.75**	3.0	1.60	2.1	3.50	2.00	1.3	1.25	1.6	1.7	3.75**	4.0	1.0*
Cup cake	6.0	4.00	4.00	3.0	2.00*	2.0*	3.00	3.00	2.0*	2.00*	4.0	2.0*	7.00**	3.0	3.0
Sponge cake	2.25**	1.87	1.10	2.0	0.80	1.3	1.40	2.0	1.0	1.0	1.6	1.1	1.0	1.2	0.4*
BREAD (Nos.)															
Common	23.00	25.00**	23.00	3.0*	4.0	18.0	22.00	28.00	10.0	8.0	6.0	11.0	17.00	24.0	7.0
Sweet	21.00	22.00	22.00	2.0*	4.0	18.0	27.00**	18.00	9.0	7.0	5.0	9.0	13.00	20.0	5.0
Fruit	8.00	9.00	9.00	1.0*	3.0	12.0	14.00**	8.00	7.0	5.0	3.0	7.0	11.00	14.0**	3.0
Bun	10.00	10.00	12.00	2.0*	5.0	13.0	14.00**	9.00	7.0	5.0	4.0	8.0	11.00	11.0	3.0
Butter bun	6.00	7.00**	6.00	1.0*	2.0	5.0	6.00	1.00*	1.0*	1.0*	2.0	2.0	5.00	5.0	1.0*
BISCUITS (Nos.)															
Company	10.00	14.00**	14.00**	3.0*	4.0	11.0	11.00	5.00	5.0	5.0	5.0	3.0*	7.00	6.0	5.0
Local	2.60	4.00	4.00	0.4	1.25	2.8	4.20**	2.50	0.5	0.5	0.25	0.03*	3.00	4.20**	0.5

Items	East Fort (12 shops)	Ulloor (8 shops)	Medical College (9 shops)	Sastha-mangalam (5 shops)	Peroor-kkada (12 shops)	Statue (6 shops)	Thampa-noor (7 shops)	Pettah (4 shops)	Patoor (6 shops)	Sreekariyam (4 shops)	Vazhu-thacadu (6 shops)	Over bridge (7 shops)	Bakery Junction (4 shops)	Palayam (5 shops)	Kesava-dasapuram (5 shops)
SWEETS (Nos.)															
Jelabi	29.00	40.00**	39.00	10.00	21.00	25.0	38.00	19.00	11.0	9.0*	10.00	11.0	36.00	19.00	7.0
Laddu	29.00	38.00**	33.00	9.00	20.0	23.0	38.00**	16.00	11.0	10.0	8.0	9.0	33.00	18.00	6.0*
Jam roll	5.00**	5.00*	5.0	-	0.5	0.3*	1.00	3.00	0.3	-	0.5	0.5	1.50	1.2	-
Dilkush	5.00	5.00	4.0	1.00	1.0	0.5*	4.00	5.50**	4.3	0.5	2.0	2.0	5.00**	3.0	0.6
Nancut	1.00**	1.00**	1.0**	-	0.25	0.30	0.28	0.25	-	-	0.3	0.1*	0.50	5.00**	-
Mysorepak	0.6	1.00	1.0	0.1*	0.1*	0.20	-	0.30	-	0.3	0.1*	1.20**	0.6	0.600	-
Boli	2.00	2.00	3.00*	0.5	0.50	1.00	-	-	-	-	0.4*	1.00	-	-	1.4
Groundnut sweets	5.00	4.00	3.00	1.0	4.00	7.00**	3.00	4.00	1.00	3.0	0.2*	7.00**	-	-	2.0
Gingelly sweets	2.00	2.00	1.00*	1.0*	1.00*	2.0	0.50	-	3.00**	2.0	0.5	1.00	-	-	-
Halwa (kg)	4.10	5.00**	4.0	1.00*	1.0*	3.00	2.00	2.00	3.0	2.0	5.00**	-	-	1.0*	
Toffee (kg)	1.00	1.00	1.00	0.10*	1.00	3.00**	1.00	-	2.00	2.00	2.00	1.00	-	-	1.0

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FRUIT BASED PRODUCTS															
Carbonated beverages															
(Nos.)	23.00	29.00	14.00	10.00	17.00	56.00**	18.00	17.00	21.00	20.00	11.00	22.00	-	-	7.0*
Fruit juice															
(Nos.)	21.00	29.00	24.00	9.00*	15.00	50.00**	15.00	14.00	20.00	21.00	12.00	16.00	-	-	7.00
Soda															
(Nos.)	2.00	2.00	1.00	1.00	1.00	0.50	2.00	2.00	0.50	4.50**	1.00	0.20*	2.0	0.4	0.8
Rasna															
(Nos.)	1.50	2.00	1.00	1.20	0.58	0.67	1.20	2.20	0.50	3.75**	0.50	1.57	2.75	0.20*	0.6
Squash															
(Nos.)	0.58	0.30	0.40	0.60	0.16*	0.3	0.40	1.00	0.50	1.00	0.80	0.66	1.10	1.60**	0.8
FRIED ITEM (kg)															
Banana chips	2.90	4.50	3.60	1.60	1.00*	3.0	4.85**	4.50	3.83	4.50	6.16	3.71	4.50	2.4	1.6
Potato chips	1.20	1.00	0.40*	2.00	0.50	2.16	0.90	2.50	1.00	1.75	2.50	1.14	3.50**	2.80	0.6
Jack fruit chips	0.60	2.20	0.30*	1.60	0.30	2.30	1.20	1.20	0.66	2.00	0.80	0.50	2.00	2.80**	0.60

Items	East Fort (12 shops)	Ulloor (8 shops)	Medical College (9 shops)	Sastha-mangalam (5 shops)	Peroor-kkada (12 shops)	Statue (6 shops)	Thampa-noor (7 shops)	Pettah (4 shops)	Patoor (6 shops)	Sreekariyam (4 shops)	Vazhu-thacadu (6 shops)	Over bridge (7 shops)	Bakery Junction (4 shops)	Palayam (5 shops)	Kesava-dasapuram (5 shops)
Mixture	0.20	1.50	0.80	2.40	0.10*	1.30	1.77**	1.70	1.50	1.70**	1.00	1.14	1.00	1.60	0.30
Murukku	0.10*	0.70	0.30	1.20	0.20	1.30	1.42**	4.00	0.33	2.00	0.66	0.42	3.00	1.20	0.20
SNACK ITEMS (Nos.)															
Meatpuffs	10.40	12.60	11.67	10.80	8.50	10.66	12.00	8.50	7.66	11.00	4.83	6.28	16.25**	5.80	4.00*
Sweetpuffs	4.50	7.25	8.30	7.00	6.58	6.30	7.42	8.00	6.66	8.50	3.30*	9.14**	8.50	6.00	5.80
Vegetable puffs	9.00	11.10	10.10	12.40	7.25	8.60	8.8	8.00	7.50	13.00	3.00*	7.40	15.50**	5.00	2.00
Eggpuffs	5.25	9.00	7.56	8.40	6.80	4.66	5.14	13.50	5.00	12.50**	11.33	7.40	7.00	6.00	1.60*
Cutlets	6.00	8.50	6.90	6.40	5.90	8.33	8.80	13.00	7.00	9.75	12.00**	4.50	9.50	7.50	1.00*
Samosa	4.16	2.30	5.90	3.60	3.16	9.83	8.86	17.70	3.00*	8.00	13.00	9.00	18.00**	7.60	3.60
Rusk(kg.)	0.25*	6.30	0.90	0.60	0.30	0.50	0.70	0.50	-	1.00	-	0.28	0.25	0.60	-
Vada	6.70**	4.75 **	2.00	1.00	4.50	-	2.00	-	-	-	0.50	-	-	2.60	1.60

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DAIRY PRODUCTS (Nos.)															
Ice cream	6.70	6.30	8.90	7.60	6.70	7.00	11.00	5.00	3.30	5.00	13.00**	2.60	9.50	5.00	3.00*
MilkPowder	1.67	4.75**	2.70	1.30	1.91	2.60	4.10	4.50	2.16	3.00	1.80	4.70	1.40	1.40	0.60*
Condensed milk	0.16*	0.37**	0.30	0.20	0.16	0.50	0.20	0.20	0.10	0.10	0.10	0.20	0.50	0.20	0.40
MISCELLANEOUS (Nos.)															
Noodles	0.80	0.80	0.50	0.40	0.20*	1.00	1.00	0.50	0.50	2.00	2.10	1.70	1.80	2.40**	0.40
Pickle	1.50	1.40	0.90	0.60	0.20*	0.20*	1.70	0.25	0.33	0.50	1.80**	0.40	0.50	0.40	0.20
Jam	0.60	1.00	1.00	0.40	0.20	0.20*	1.10	1.00	0.33	1.25**	1.00	0.70	-	0.20	0.60
Sauce	0.40	0.40	0.20*	1.60	0.40	0.80	1.40**	-	-	1.00	1.30	-	-	-	-
Popcorn	0.20*	0.60	0.30	0.40	0.08**	0.33	0.40	0.50	0.50	1.00	1.00	-	0.50	-	-
Samanthi-Powder	2.42**	2.00	2.00	-	-	0.20*	0.60	0.70	0.80	0.70	-	0.10	0.50	0.40	0.60

* Lowest sale

** Highest sale

SANITARY QUALITY AND ADULTERANTS IN SELECTED PROCESSED FOODS

By

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ABSTRACT OF THE THESIS
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Department of Home Science
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ABSTRACT

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The study entitled "Sanitary quality and adulterants in selected processed foods" was conducted to identify the contaminants and adulterants found in most commonly consumed processed foods through chemical and microbial evaluation.

The study comprised of two independent surveys to identify the most commonly sold and consumed processed foods. The identified items were subjected to chemical and microbial analysis.

The survey conducted among selected (100) households in Trivandrum city revealed the socio-economic status of the family, extend of use of processed foods and knowledge of the respondents on the sanitary quality of foods. From the survey, it was found that majority of the respondents were Hindus living in urban pockets with nuclear type of family. The average income of the respondents ranged between Rs.1000 to 2500 per month.

An inventory survey was also conducted among 100 shops in 15 selected areas of Trivandrum city. These 15 areas were selected from the map of Trivandrum city based on the assortment of shops selling processed foods. From the survey it was found that 17 items were sold to a greater extend (out of 58 different items sold in the shops) than other processed foods selected for

detailed study. The other 6 items were excluded because they had already been subjected to 'quality testing' based on PFA rules.

The foods thus selected for evaluation were icecream, fruit juice, fruit drinks, ground nut sweets, milk, soda. Jelabi, laddu, biscuit, bread and cakes were excluded from microbial analysis as these foods were subjected to processing by high temperatures, which reduced microbial load.

Results of microbial analysis showed that all the 10 samples were free of microbial contamination.

Analysis of composition, to check whether the food samples confirmed to the standards specified by ISI revealed that all the food samples were free from adulteration. However 2 ice cream samples and a fruit drink sample (out of 10 samples each tested) were not upto the standard specified by ISI. The fat content of 2 ice cream samples and total solid content of a fruit drink sample were below the standard specified by ISI.

Thus the study revealed that the items most frequently used by consumer of Trivandrum city and sold in abundance, from the shops were found to be of good sanitary quality and were found to be free of adulterants.