Nutritive Value of Selected Foods Eaten by the Kota and Kadar tribes

BY

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Introduction

I. INTRODUCTION

Mankind is proceeding towards greater and greater homogeneity - racially, culturally and linguistically. This march encompasses a variety of dimensions and some agonising implications. Oldest cultures are either dying or being exterminated. In such a broad category comes a great segment of humanity known by a bewildering variety of names such as primitive, tribal, indigenous, aboriginal, native and so on.

By definition, " a tribe is a collection of families bearing a common name, speaking a common dialect, occupying or professing to occupy a common territory" (Imperial Gazeteer of India).

Tribal groups form an important segment of the Indian population and the socio economic status and cultural pattern of these tribes are known to vary considerably (Hanumantha Rao et al., 1974).

As per the 1971 census, the scheduled tribe population numbered 3.8 crores constituting about 7 per cent of the country's total population (Uplift, 1983-1984).

The tribals of India may be described as nomadic herdsmen and agriculturists. They are often nomadic sheperds and cultivators accustomed to shifting cultivation (Chattopadhyay, 1978), since "for centuries the environment has been the real rulers of the tribals".

the 42 tribes, the leading tribes are malayalis, Irulas, Kattunaikans, Kotas, Kurumbar, Pariyars, Todas, Muduvas, Malasars, Kadars, Pulayans, Paliyans and Sholagars (Venkataraman, 1974).

The problem of providing adequate nutrition is very important in the tribal areas as the dietary standard of the tribals is so low that their diet hardly provides them the essentials of food elements like proteins, fats, minerals, vitamins etc., in proper proportion. Some of the tribals have to subsist merely on wild roots and tubers during lean months. In all the ill-nourished among the tribal families it is the newly born and the young children who suffer the most. Malnutrition affects the capacity of a child to resist diseases. Malnutrition during this stage of development leaves a permanent mark on life.

Because of the secluded living of those tribal groups their dietary pattern is also often peculiar. Not much is known about the adequacies and inadequacies of their diets. Are their diets just as deficient and unbalanced as the average Indian diet? Do they have access to any unusual or uncommon foods naturally occuring in their lonely abodes? are some questions unanswered and since these communities are slowly becoming extinct in their old environment and natural setting, the chances of knowing any details about their traditional food

habits are also becoming rare. However, it is not altogether possible to condemn or over look the age old traditional food habits of these culturally distinct entitles. It is a matter of interest to know what special foods do they get in their special set up. What are the specific nutrient contributions of these foods and the like if valid conclusions are to be drawn with their nutritional profiles. Hence the objectives of this study.

There is a death of information on the uncommon foods eaten by the tribal communities in general and information on the nutrient contribution is even more scarce. Hence it was thought of interest to study the nutritional constituents of a few selected uncommon foods consumed by two specific tribal communities of Tamil Nadu.

The study aims specifically at evaluating the nutritional composition of four selected foods eaten by the Kota Community of Nilgigris hills and five selected foods eaten by the Kadar Community of Anaimalai hills for their nutrient content.

Review of Literature

II. REVIEW OF LITERATURE

The literature pertaining to this study on "Evaluation of nutritive value of selected foods eaten by Kota and Kadar communities of Nilgris hills and Anamalai hills" respectively, is reviewed under the following sub heads:

A. Population statistics on tribes of India

B. Dietary pattern and food customs of tribal communities

C. Pattern of nutrient intake among some tribal communities and nutritive value of some tribal foods

D. Nutritional status of some tribals.

A. Population Statistics on Tribes of India:

As per the 1971 census, the scheduled tribe population numbered 3.8 crores constituting about 7 per cent of the country's total population (Uplift, 1983-1984). There are about 266.93 lakhs scheduled tribes spread over about 20 per cent of the total geographical area of the 19 states and union territories and constituting about 74 per cent of the total scheduled tribes population in the country (Sinha, 1983-1984).

In Tamil Nadu, there are as many as 42 tribes, whose population according to the 1971 census was 3,11,515 as against 2,51,991 of the 1961 census (Venkataraman, 1974).

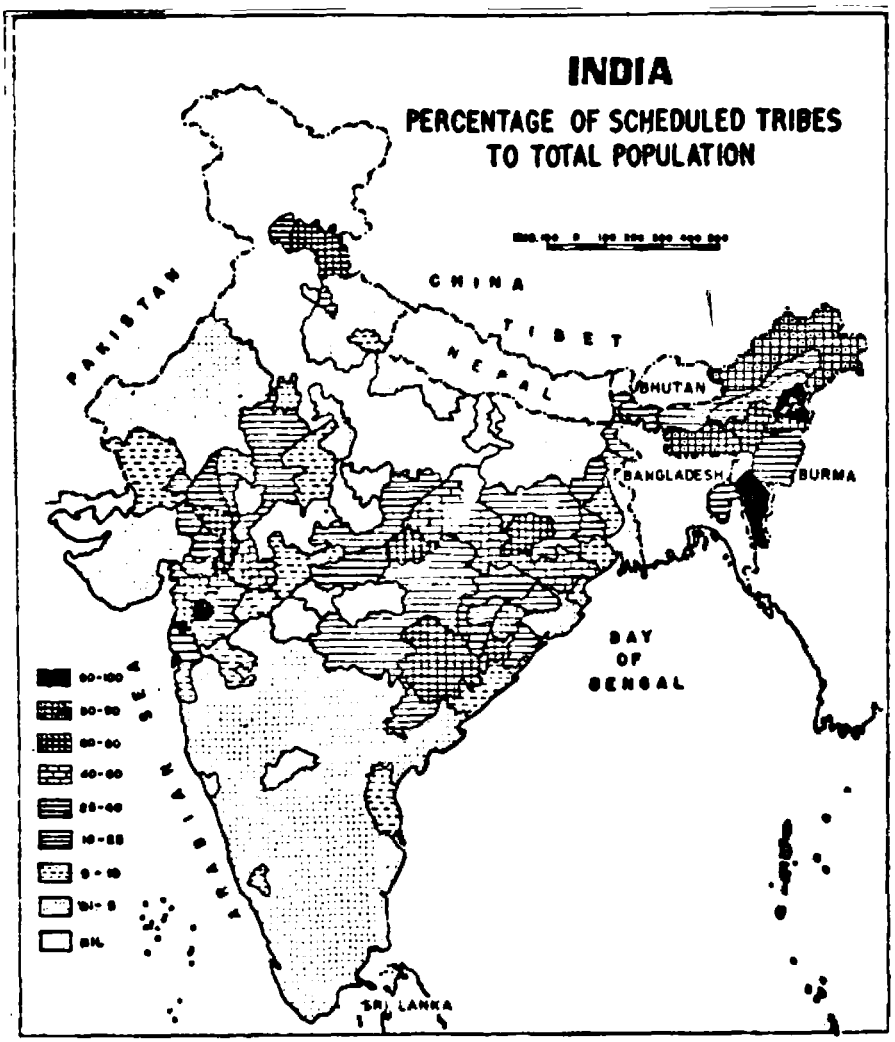
INDIA
PERCENTAGE OF SCHEDULED TRIBES
TO TOTAL POPULATION
CHINA
TIBET
NEPAL
PAKISTAN
BHUTAN
BANGLADESH
BURMA
BAY
OF
BENGAL
SRI LANKA

FIGURE - 1

A brief statistics of the leading tribes in Tamil Nadu may be summarised as:

Malayalis (1,29,952) are concentrated in the three districts of North and South Arcot, Salem and Tiruchirapalli, in the Yelagiri and Javvadix hills, the shervaroys and Kolli hills and in the Pachimalai hills respectively. The second largest humbering tribals in Tamil Nadu are the Irulas (79,835) found all over the state. In the descending order of population are Kattunaickans, (6,459), Kotas, (833) Kurumbas (1,174), Paniyans (4,779) and Todas (714), found in Gudalur, Kotagiri, Coonoor and Ooty taluks respectively of the Nilgiris district; Kadars (293) Muduvars (119) Malasar, (1,999) of the Anaimalai hills of the Coimbatore district; Paliayans (155), Pulayans (4,779) of the Palani hills of Madurai District; and Sholagars (6,139) found in the Satyamangalam area of the Coimbatore district.

B. Dietary Pattern and Food Customs of Tribal Communities:

As time changes, the old customs and traditions are vanishing slowly. In olden days people relied only on raw foods available in their forest abodies. As civilization advanced they began to shed their old customs and started adopting the newer ways of eating, drinking etc., But there are a few

primitive tribes who still follow the old customs and traditions. In the following pages selected studies on the dietary practices and food customs of specific tribal communities are reviewed.

1. The Baigas:

The baigas as reported by Vyas (1978) are primitive agricultural people who inhibit territory in the central provinces of India, east, and north-west of the Maikal mountains. The staple food of the Baiga is the simplest and coarsest. Pej gravel of Kutki or Kodan is the main article of their diet. They supplement their diet with a variety of leafy vegetables, roots, fruits, tubers and herbs. Fish is not considered to be a heavy food, for the Baiga believe it can be digested in half the time of usual diet. It is prepared in oil and butter milk spiced with turmeric, chillies and salt. Baiga relishes meat diet. Most of the Baiga keep poultry and thus eggs enter their diet frequently. But fowls and chickens are usually reserved for sacrificial food.

Ghee or oil is not consumed daily in a Baiga home. Baigas generally do not prepare ghee as the milk yield is very low in hilly regions. Similarly oil is a luxury enjoyed on rare occasions. Ramtilla oil is extracted at home with the help of an indigenous oil extracting apparatus known as petla.

But in the more opened up areas where Baigas have easy and regular access to weekly markets til or mustard oil has come into vogue. Where mahuva seeds known as gulli are available in plenty, gulli oil is extracted with petla and receives Baigas first preference.

Sugar or gur is consumed rarely only on ceremonial occasions. In most of the isolated villages sugar is still unknown and gur is considered a first class sweet both by the children as well as the old. Honey is easily available in the forests and therefore, it serves the purpose of gur or sugar. A Baiga relishes honey very much and therefore calls it 'rasa'. A Baiga spends nearly 76 per cent of his total cost of living on food namely ~~food namely~~ food grains, spices, oil vegetables and gur.

2. The Bhils:

Bhils of Madhya Pradesh are agricultural people, the main diet is what they produce in their fields; banti, Kodara mor, nagli, juwar, and makka, pulses like adad, tuvar or grams. Kadari is boiled in water till cokked, seasoned and taken. The water in which it is boiled called, pej, is separated and given as soup to children. A nursing mother is also given this soup so that her milk production is increased. Kodri and rice are eaten with the tur dal, grams or adad. Dal is prepared and

cooked, in the same way as other Hindus, do, though it is not spiced and fried in oil as much; for the Bhil cannot afford to do so. When dal is not available, leaves of edible plants are cooked as vegetables and eaten with Kodri. Eggs and fowls are costly and are eaten only on festivals. Fish is also eaten whenever caught. Thus, though poor, the Bhils eat a variety of things, know many preparations and employ most of the known methods of culinary art (Naik, 1972).

3. The Chenchus:

The chenchus (NIN, 1973) are primitive people of southern hyderbad. This tribe is divided into three groups. The most important of these, the "jungle chenchus" inhabit the hills to the north of the Krishna river. They subsist mainly on the gathering of wild forest produce, supplemented by hunting, fishing and the collection of wild honey and Mohua flowers. The latter are used not only as food but also for the preparation of liquor. The chenchus keep a few cattle and sometimes cultivate a little grain but they are primarily food gatherers.

4. The Nagas:

The Nagas (Iyer, 1981) of west of the Doyang river are truly Omnivorous. Frogs, lizards, snakes, rats, dogs, monkeys, cat etc., are all delicacies and an animal that has died a natural death is as acceptable to them as the best butcher's

meat. They drink daily quantities of rice beer which is made of such consistency that it serves them for breakfast. Their use of tobacco is unique. They collect the tabacco oil that is precipitated in the bowl of the pipe and drink it mixed with a water.

5. The Vedda:

The Vedda (Iyer, 1981) of Ceylon eat no less than five kinds of rotted wood, usually garnished with honey, bark, leaves and fruits. Among some of the Guiana tribes green-heart seeds which are woody in consistency were grated, soaked and mixed with rotted wood, pounded previously and sifted, at those times of the year when cassava bread was scarce (Schomburgk, 1937).

6. The Malayans:

These are another jungle tribe inhabiting the Cochin forests. They are divided into two sub tribes. (1) The nattu (native) malayans who are probabaly the original inhabitants of the hills and (2) the Konga Malayans or malasars, who appear to have immigrated from the forests of Coimbatore district, and settled in the state forests.

The greater part of their food consists of wild yams (Dioscorea). They take Kanji prepared from Chama (Panicum

miliaceum), Kora and Kambu. This is consumed in the morning before they go to work and the same Kanji with roots boiled and salted form their evening meal. During the working season, they live upon rice, paddy, salt and other products supplied to them by the contractors. While at other time they depend upon the wild roots of the forests. Sometimes they make a delicious preparation out of bamboo seed. They fill a hollow bamboo, 2 feet in length and 4 or 5" in dia meter with bamboo seed and pour in honey and then close the mouth of the bamboo air tight. This is then coated with a layer of earth and placed in a bright red hot fire, sufficient time being allowed for the grain to be well boiled in the honey. The bamboo split, when quite red hot in the inside is seen a cylindrical soft and sweet mass which forms their dainty meal. This they consume with a deep draught of water. They also eat the remains of carcases left by tigers as also the flesh of deer, bison and goat but abstain from touching the flesh of the cow, wolf, elephant and tiger (Iyer, 1981).

7. The Konda Doras:

The Konda Doras (Rao, 1968) are one of the scheduled tribes in Andhra Pradesh who are widely distributed over the five adjoining coastal districts of Andhra Pradesh Viz.

Srikakulam, Visakapatnam, East and West Godavari and Krishna. However, they are largely concentrated in Visakapatnam district.

A pregnant women should observe certain food taboos; a breach of which is believed to cause sickness and death either to the mother or to the foetus or both. She should not drink rice beer, should not eat pulses like Bobbarlu (cow peas) since it is believed that the neonate will be afflicted by evil spirit. Millets like maize, vegetables like pumpkin, fruits like jack fruit and meats of hare and sambur (Kanuzu) are forbidden. It is believed that her stomach swells out and there will be excessive bile accumulation in the stomach if she eats jack fruit and pumpkin. If she eats the flesh of a hare the child is believed to suffer from epilepsy. Abortion is believed to occur on consumption of rice beer.

After delivery special food is given. It is prepared by mixing the ragi flour in boiling water; they fry the pith of wild date and onion in oil and this food is given to the woman.

8. The Santals:

The Santals (Biswas, 1956) eat almost everything. They generally live on vegetable diet because they cannot afford to

eat meat often but when they get meat they eat too much. Their staple food is rice. Besides boiled rice, the santals eat parched rice which they call 'Khajari'. They put some sand in a broken or shallow earthern ware and place it over the fire place. They sprinkle some salted water on the rice which is to be fried and mix it properly. Some of the rice they then place over the heated sand and stir with a broom stick of coconut leaves. When the rice properly swells they take it out of sand and eat it smeared with mustard oil or with molasses. From rice they prepare cake, the local name of which is 'Pitha'. The pulses eaten by santals are Arhar (Cajanus indicus spring), Khesari (Lathyrus Sativus), Mung (Phaseolus mungo) and Masuri (Lens esculanta).

9. The Baoris:

Baoris (Purohit, 1979) usuall y consume inferior cereals and live stock products. Superior cereals are occassionally consumed on social events like marriages. The food is cooked on clay pots known as 'Kelari'. Garlic, onion and chillies are preponderantly dominant contribution of their vegetable diet. They mostly use oils instead of ghee. Generally these people are non vegetarians and eat meats of goats, sheep and sometimes buffalo calf. They eat all types of flesh and are much addicted to the use of liquor.

10. The Gond and Bhumia:

The diet of the gond and Bhumia of Eastern Mandla (Fuchs, 1959) is monotonous to the extreme. Most days of the year it consists of Kodo and Kutki only. Kodo is a small millet (Paspalum scribulatum) and Kutki is a smaller grain of the same type (Panicum miliaceum). Kutki is considered a richer food than Kodo which on the otherhand is more easily digested.

Kodo and Kutki is prepared in two ways: It is husked and then boiled to a broth which is called pej. If the grain is boiled till the water has evaporated, it is called bhat. Husked kodo is called kodai. While kodo and Kutki are their mainstay, the gond and Bhumia vary their usual diet sometimes by a dish of rice. They even prefer rice to Kodo or Kutki but cannot often afford it; for their fields are mostly too poor for rice cultivation.

At times of scarcity, the dry flowers of mahua are mixed into the gruel. The flowers of the mahua tree are collected in the early morning during the hot season, dried in the sun and stored in baskets. They are mixed into the Kodai a or kutki gruel, though sometimes the Bhumia and Gond eat them raw or roasted. Of course, the greater portion of the collected mahua flowers are used for the distilation of liquor.

The jungle provides Gond and Bhumia with a rich supply

of vegetables which are eaten with the cereals. The vegetables commonly consumed are khotna and jarota (Cassia obstusifolia), beti a kind of creeper, pumpkins like kalindar, leaves of raswa, dorai, chinach (Corcorus oliforius), chakoara (Cassia-tora), Pipar (Ficus religiosa) etc., The Gond and Bhumia also relish the fruits of mohlain (Bauhinia vahilli) bar, (Ficus indica) bel (Aegle marmelos), Khameri (Gmelina arborea), mango and jamun (Engenia jambolana).

Roots and tubers are occasionally collected and prepared for food, especially when there is scarcity of grain. The edible roots and tubers are the kanhiakanda, kundru root of a creeper (Coccinia indica), dudhia kanda and lithrora,. Another much relished food is bamboo rice. The Gond and Bhumia like most aboriginal tribes feel a strong craving for a meat diet.

11. The Muduvars:

Muduvars of the Anamalai hills are a food gathering tribe. They share their food those with who have nothing, living on the principle, one lives for the other. They live by fishing hunting and shifting cultivation. Many of them are employed in the forest department and are gained some plot of land for cultivation. They also maintain dairy (Venkata-raman, 1974).

12. The Paniyans:

Paniyans (Venkataraman, 1974) of Nilgiris hills are good agriculturists. They take rice gruel along with vegetable curry and fish. Tea drinking is popular among them. They do not take enough milk, pulses, egg and mutton. The vegetables which they commonly use is the green plantain grown in the field or near their huts. They eat the flesh of black monkeys, squirrels and rabbits which they kill with their spear. Paniyans out of their wages spend as much as 80 per cent on food and the rest on other expenses.

13. The Todas:

Todas of Nilgiris hills consume large quantities of milk and milk products. They are not normally flesh eaters and the flesh of female cattle is a taboo as it yields milk (Chattopadhyay, 1978). The staple cereal of the Todas is rice. Coffee or tea was consumed two or to three times a day, as a traditional habit which helped to satisfy hunger and thirst, to be more active and to get relief from chillness (Devadas et al., 1969).

14. The Irulas:

The Irulas eat sheep, goat, field rats, fowl, deer, pig, jungle fowl, pigeon and quail. Buffaloes and cattle were restricted. They eat the foods from the fields, until

the harvest and for the remainder of the year, they live on a kind of yam which is known as 'Irula root' (Thurston and Rangachari, 1909, Iyer and Ratnam, 1961). The Irulas of the Nilgiris are non vegetarians. Rice and dhal are commonly consumed by them. During the rainy season, wild roots and tubers are eaten.(Devadas et al., 1969).

15. The Kadar:

The Kadars of Anamalai hills will eat the putrid and fly blown flesh of carcases of wild beasts which they come across in their wanderings. To a dietary which includes succulent roots which they upturn with a digging stick, bamboo seed, sheep, fowls, rocks snakes (python), deer, porcupines, field rats, wild pigs, monkeys etc., they do credit by displaying a hard well nourished body. The mealy portion of the seeds of the cycas tree, which flourishes on the lower slopes of the Anamalai hills forms a considerable addition to the menu (Thurston and Rangachari, 1909).

16. The Kotas:

The general meal pattern of the kotas of Nilgiris hills consisted of one cereal preparation, one dhal preparation and a preparation with potato. In addition coffee and tea were also consumed (Devadas et al., 1969).

C. Pattern of Nutrient Intake Among Some Tribal Communities and Nutritive Value of Some Tribal Foods:

The nutritive value of the diet of some of the tribes is very low in comparison to others. The consumption of protective foods were in adequate. The caloric value of the diet was below normal. This is due to their economic backwardness. The meals of some of them consist of roots, tubers wild plants and at times flesh, fish and meat. The nutritive value of the tribal diet has gone down in recent years. Lack of supply of meat and the disappearance of wild fruits, roots and herbs are the two main factors responsible for their ill nourished diet. The growth of children has been badly affected and their mortality is high. The tribes who consume sufficient quantities of meat which is rich in protein and minerals have good physique than the others. The general health and the growth of their children reflects the nutritional deficiencies. For instance the Malapandarams in Kerala were getting inadequate and poor diets and they were the worst hit by the bad selection of foods. Inspite of the inadequate calorie in take the Nokte Naga tribe could get more nutrients. They are healthy, energetic and cheerful (Sen Gupta, 1970).

In the diet of the Maha deo Koli tribe from Khireshwar (Chitre et al., 1983) in pre-harvesting seasons rice contributed

37 per cent atta 46 per cent and pulses 17 per cent of the total energy intake. The corresponding figures in the post harvesting season are 46 per cent from rice and 34 per cent from atta and 21 per cent from pulses. The mean energy intake is 1102 kcal/consumption unit in pre-harvesting season. 54 per cent of the families satisfied their requirement for energy in post harvest season. This intake of energy when compared with the ICMR allowances, showed deficiency of caloric intake for all the families is both the seasons (Robson, 1974).

An adult Maria Gord, according to the observations of Pingle (1974), collects about 3 kg per day of a variety of tubers the "Tella Gadda" and on an average eats 425 g per meal. This provides as much as 21 g protein and 635 k calories. In the north eastern parts of Sironcha a variety of beans called Tavi, containing 29 per cent protein, is cultivated. The seeds are boiled and eaten with mahua flowers.

When compared with FAO/WHO requirement, the protein intake of the Mahadeokoli from Khireshwar was adequate quantitatively. Gore et al., (1977) estimated the protein intake of tribal from the Indravathi river basin of Orissa, Madhya Pradesh and Maharashtra states as 36 g and 44.7 g per nutritional unit.

Among the tribes of Orissa, Madhya Pradesh and Maharashtra (Gore et al., 1977) the average caloric and protein intake

per nutritional unit were 1,665 k calories and 36.1 g protein. Sharma (1976) observed an intake of 1,385 k calories and 44.7 g protein in a survey of about 50 tribals families in Abuzhmal area of Bastar. Kosra, the staple food in Abuzhmal has a greater protein content than rice.

Chitre et al., (1976) have reported that among the tribals in Bihar and Maharashtra intake of several essential amino acids is deficient frequently without frank signs of malnutrition.

Not much information is available on nutritive value of foods consumed by tribal population, in the country. A programme of systematic screening of tribal foods was therefore initiated by ICMR (1981). Seven foods of plant origin collected from the tribals of Chandrapur forest area (Maharashtra State) included one minor millet (Kosri), 2 leafy vegetables (Doba and Kuzhukijabha), 2 fruit vegetables (Kotikaya and Narungudi) and 2 other vegetables (Boja pod kernals and seeds of paur tonda). A sample of pith of the bark of sulpa palm (Caryoto urens) consumed by tribals of Orissa, seed sample of the sub-Himalayan tree phulwara (D.Butyraceal H.J.Lam) known as Indian butter tree and a sample of defatted flour of decorticated seeds of sandal tree were also analysed for the nutrient content.

Among the foods of Chandrapur forest area, the kernels of boja poa and paur tonda were rich in protein. Paur tonda seed kernels were also rich in total fat content. The two leafy vegetables were unusually high in their calcium, iron and also protein content. The millet kosri with its high calcium content (317 mg per cent) resembles ragi in this respect. The protein content of this millet is more than that of ragi.

Pith of the sulpa palm is very poor in iron and protein but relatively rich in calcium. Almost all the carbohydrate in the pith was accounted for by starch (78.2 per cent) and its free total sugar content was only 1.6 per cent.

The whole seed of phulwara has thick seed coat and which can be easily removed. The kernel weighing about 70 per cent of the whole seed contains about 64 per cent fat and 20 per cent protein. The kernel is known to contain saponins and is not edible but the fat extracted from it has consistency similar to that of ghee is some times used as an adulterant. The fatty acid composition of the phulwara kernel fat (Palmitic acid 59.8 per cent oleic acid 32.6 per cent, stearic acid 1.9 per cent and linoleic acid 5.5 per cent) suggests that it can be used as a cocoa butter substitute.

Like any other defatted oil seed meal, the sandal tree seed meal was found to be rich is protein and mineral content.

Experimental Procedure

III. EXPERIMENTAL PROCEDURE

The methodology involved in the conduct of the study, "Nutritive value of selected foods eaten by Kota and Kadar communities of Nilgiris and Anamalai hills" may be dealt under the following headings:

a. Selection of the Area

b. Formulation of the schedule for dietary survey

c. Selection of foods for analysis

d. Analysis of the nutrient composition.

A. Selection of the Area:

Two areas namely, Anamalai hills and Nilgiris hills inhabited by the two tribal communities, Kadars and Kotas, respectively were selected for the study.

Anamalai or "Elephant hills" is situated at a height of about 2350 feet above the sea level. Erumaiparai, which is the place where the Kadars live is situated at a distance of one and a half kilometres from Topslip.

In Nilgiris hills, Kotas inhabit seven villages of which six Kotagiri, Kilkothagri, Thodanad, Sholur, Kethi and Kundha are on the Nilgiri plateau and the last one is at Gudalur at the North west base of these hills. Of these seven settlements, Sholur was selected for the study because of its easy

accessibility by bus. Sholur is about 15 kilometres from Ooty town. These two areas were selected for the study because both the areas were accessible by bus and have not been studied, before.

B. Formulation ofSchedule for Dietary Survey:

An interview schedule was formulated for collecting information regarding the dietary habit of Kadar and Kotas. The interview schedule was formulated so as to give information on the following lines. Number of family members, their literacy level, marital status, food pattern food expenditure pattern, foods given under special conditions, diet during illness, foods produced at home, methods of cooking, foods preserved, foods processed and weaning practices. The schedule is given in Appendix I.

C. Selection of Foods for Analysis:

From the data collected regarding thedietary pattern of the tribal communities it was seen that in the Kadar community next to rice, they rely on wild roots and tubers which they dig deeply and take during their hunt for food. They eat about seven different kinds of roots and tubers and also the rice from bamboo plant namely, "Kalmoongil rice". Since these foods were uncommon on the plains it was thought that it will be of value to analyse the nutrient

composition of four selected tubers namely, "Nuran Khizhangu", Soriyan Khizhangu", "Naar Khizhangu", "Ayana Khizhangu" and "Kalmoongil rice".

Among the Kotas, foods namely Thadi Keerai, Puliari keerai, Pappari grain and popped amaranth seeds were the uncommon foods eaten. Hence these were selected for the analysis of nutrient composition. It was found that Kotas also eat a number of wild roots and tubers and since it was the winter season during the collection of samples the tubers were not available. Hence only the available four foods eaten specially by the Kotas were selected for the analysis.

Plate I to IV gives the view of the food samples collected from Kota and Kadar families for analysis.

D. Analysis of the Nutrient Composition:

The samples collected from the Kadar and Kotar communities were analysed using the standard procedures for the following nutrients, moisture, energy, protein, fat, crude fibre, ash, phosphorus, calcium, ascrobic acid, thiamine, riboflavin, copper, manganese, iron and zinc.

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KADAR FOOD SAMPLES

PLATES I AND II

The moisture contents of the samples was analysed by the method of NIN (1983). The fat content, crude fibre content, total mineral content, ascorbic acid content, phosphorus, protein and calcium were analysed by the method of Hawk and Oser (1968). Thiamine and riboflavin were analysed by the method of NIN (1983). Copper, manganese, iron and zinc were analysed by atomic absorption spectro photometry.

Results and Discussion

IV. RESULTS AND DISCUSSION

The results of this investigation of "Nutritive value of selected foods eaten by the Kota and Kadar communities of Nilgiris hills and Anamalai hills" are presented and discussed under the following headings:

A. General profile of the selected tribal communities.

B. Socio-economic conditions of the selected communities.

C. Dietary pattern of the selected tribal communities.

D. Nutritive value of the selected foods of the tribal communities.

A. General Profile of the Selected Tribal Communities:

1. Kota Community:

The Kotas inhabit seven villages of which six - Kotagiri, Kil Kotagiri, Todanad, Sholur, Kethi and Kunda are on the Nilgiri Plateau and one is at Gudalur at the North West base of these hills. The Kota settlement at Sholur was selected for this study. In Sholur there were 50 families. The Kota's settlement is called as 'Kokkal'. All people in this tribal community were Hindus and belonged to the Kota caste. They all are non-vegetarians and spoke a dialect peculiar to this community. The Kotas are village artisans, good in black smithy, carpentary and pottery. Agriculture is the main occupation of majority of Kotas.

Kotas live in brick walled tiled houses. Previously they used to make use of the 'Odai leaf' as thatch. But now the leaf is scarcely available and hence started to use tiles. None of the houses were provided with electricity facility or any water or drainage facilities.

The Kotas are provided with agricultural lands by the Government in which they grow green leafy vegetables, roots and tubers etc. They also cultivate a wheat like cereal namely 'Ganji' and another grain 'Pappari'. They have buffalos or cows, whose milk yield in excess of the requirement is given to the milk society for sale.

Sholur is connected with bus from Ooty town and hence there is chance for Kotas to move and mingle with non-tribal communities. Because of this the Kotas old customs and traditions are changing day by day. However they still retain some of their old customs and traditions.

2. Kadar Community:

Kadars live in a place called Erumaiparai, of Anamalai hills. They have distinct Negroid features such as short stature, dark skin short curly hair, thick lips and broad snub nose. These people are still in the food gathering stage, though many of them work as coolies in the estates and with the forest department.

All people in this tribal community were Hindus and belong to the Kadar caste. They are non-vegetarians and speak a local dialect which is a mixture of Tamil and Malayalam.

They live in tiled houses with tattered walls and roof. The roof was in a precarious situation which may fall at any time. There were no power supply to the houses. Their settlement is placed in the midst of forest and there is always the danger of wild animals. Hence the children do not want to walk the distance to go to the school. So the noon meal is being brought to their place by the noon meal organiser and a helper.

B. Social Economic Conditions of the Selected Communities:

1. Family System:

a) Kota Community: Among Kotas out of 20 families surveyed 15 were nuclear and 5 were under the joint family system.

b) Kadar Community: Among Kadars out of the 15 families surveyed, 11 were nuclear and 4 were under the joint family system.

2. Distribution of Families According to Age and Sex:

a) Kota Community: Figure 1 and Table I show the distribution of Kota families according to age and sex.

Among Kotas higher percentage of males and females were between the age group of 19-20 and the female percentage is more than that of male. About 40.86 per cent of the population were children under six years. Of this 21.82 per cent were males and 19.04 per cent were females. There were none above 69 years. Children under six constituted a good percentage of the population and requires special attention.

b) Kadar Community: Figure II and Table I shows the distribution of Kadar families according to age and sex.

Among Kadars higher percentage of males and females were between the age group of 19-29 and the female percentage is more than that of male. About 33.78 per cent of the population were children, under six and of these 13.78 per cent were males and 20 per cent were females. Thus, one third of the population of this community constituted children under six and thus require special care.

DISTRIBUTION OF KOTA FAMILIES ACCORDING TO AGE AND SEX

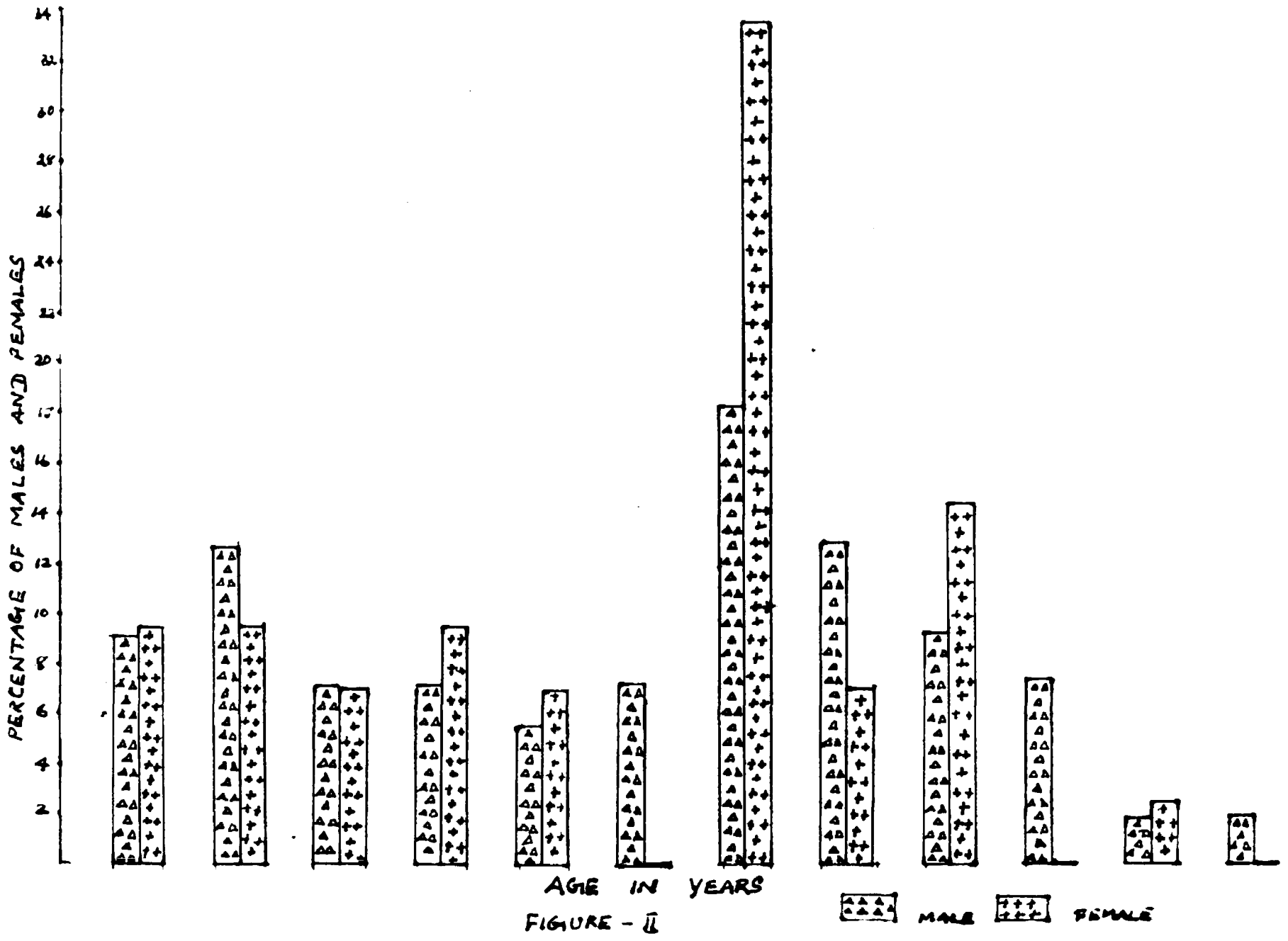

FIGURE - II

DISTRIBUTION OF KADAR FAMILIES ACCORDING TO AGE AND SEX

FIGURE - III

TABLE I

DISTRIBUTION OF KOTA AND KADAR FAMILIES ACCORDING TO AGE AND SEX

Age Group	Kotas		Kadars	
	Male Per Cent	Female Per cent	Male Per cent	Female Per cent
1 - 3	9.09	9.52	6.89	10.00
4 - 6	12.73	9.52	6.89	10.00
7 - 9	7.27	7.14	3.45	10.00
10-12	7.27	9.52	6.89	3.33
13-15	5.45	7.14	10.35	--
16-18	7.27	--	--	3.33
19-29	18.18	33.33	17.24	33.33
30-39	12.73	7.14	17.24	13.33
40-49	9.09	14.28	13.79	3.33
50-59	7.27	--	6.89	--
60-69	1.81	2.38	6.89	6.66
70 & above	1.81	--	3.45	3.33

3. Educational Status of the People:

a) **Kota Community:** Among Kotas very few have studied upto S.S.L.C. and they are provided with good employment. Women are not educated at all. There is a school near their settlement and Kota children are encouraged to join and study in the school.

b) Kadar Community: Among Kadars none of them have reached eleventh standard. Many of them are illiterates and a few have studied upto 6th Standard at the most. There is a school at a distance of one and a half kilometer from their settlement. The Kadar children do not go to school as there is always the danger from wild animals on the way.

4. Occupational Status of the People:

a) Kota Community: Among Kotas those who have studied upto eleventh standard are employed in factories like Hindustan Photo Films, Cordite Factory etc. Others are agriculturists who work on their own lands and also work as coolies in other's lands. Some of them have taken up carpentary as their occupation.

b) Kadar Community: Almost all Kadars work as coolies with the forest department. They collect the forest produce such as cane, honey, etc. and by way of selling those things to the society they earn their living.

5. Distribution of families According to Monthly Income:

Figure IV and Table II indicate the distribution of families according to monthly income.

DISTRIBUTION OF KOTA AND KADAR FAMILIES ACCORDING TO MONTHLY INCOME

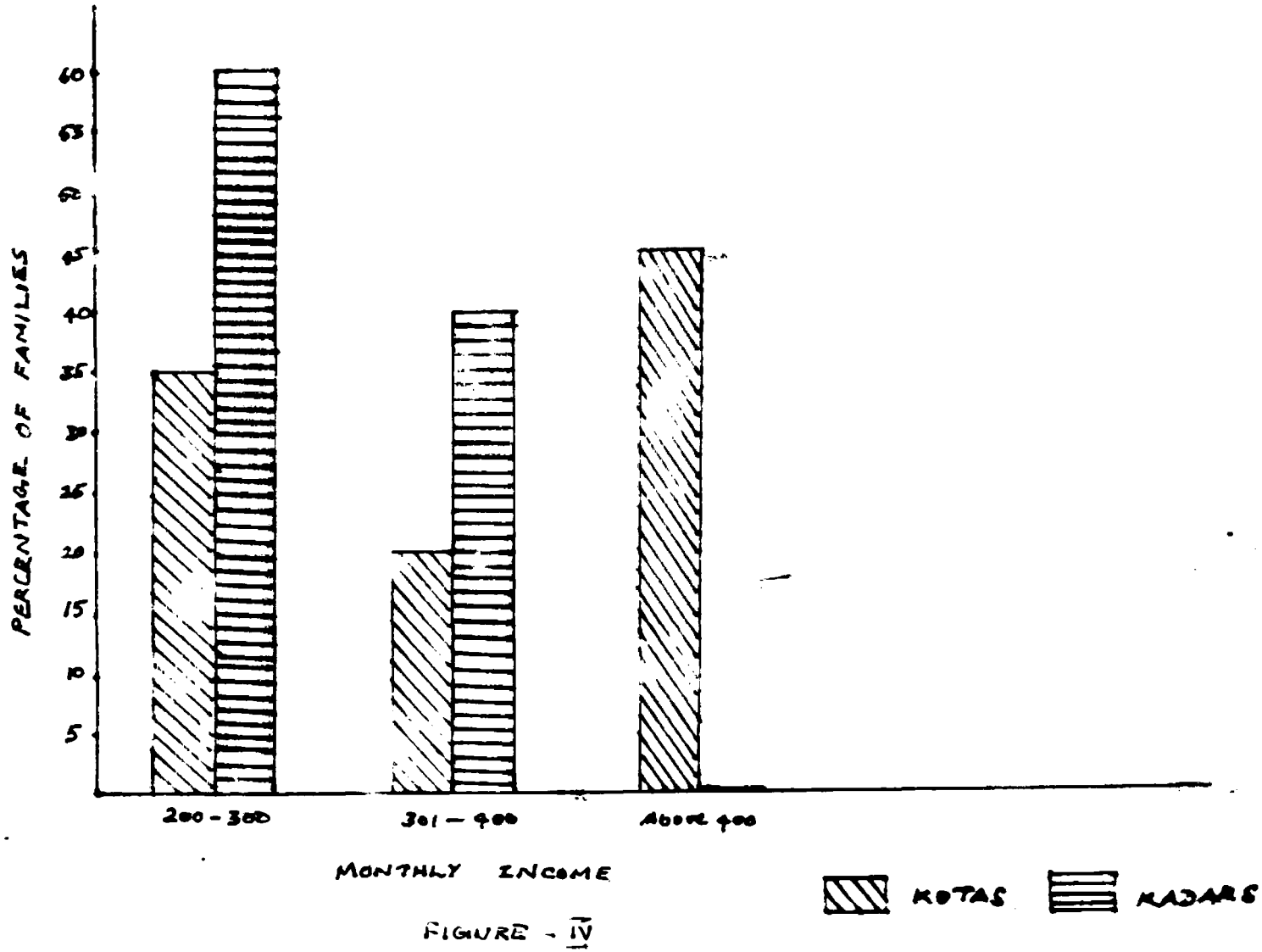

FIGURE - IV

TABLE II

DISTRIBUTION OF KOTA AND KADAR FAMILIES ACCORDING TO MONTHLY INCOME

Income Range Rs.	Number of Kota families having this income	Per-centage	Number of Kadar families having this income	Per-centage
200 - 300	7	35	9	60
301 - 400	4	20	6	40
Above 400	9	45	-	-

a) Kota Community:

Among Kotas thirty five per cent of the families had a monthly income ranging from Rs.200 - 300/- and, twenty per cent of the families had a jmonthly income ranging from Rs.300 - Rs. 400/-. A considerable percentage of the families (45 per cent) had a monthly income of above 400 rupees. However, the income is not consistent for all the months and it varied with monsoon, type and duration of cultivation etc.

b) Kadar Community:

Among Kadars, 60 per cent of the families had a monthly income raning from Rs.200-300/- and the remaining 40 per cent had the monthly income ranging from Rs.301 - 400/-. The income

varied with the availability of work with the forest department. During rainy season they will not get any job and at such periods they go to interior of forests to hunt for foods like roots, tubers, honey etc. and thus make their livelihood. Plates V and VI gives a view of Kota and Kadar tribal communities.

C. Dietary Pattery of the Selected Tribal Communities:

To elicit the dietary pattern of the Kota and Kadar communities, a dietary survey was conducted by the investigator. The details of their dietary pattern with regard to food pattern, food expenditure, foods consumed, foods given under special conditions, diet during illness, methods of cooking, foods preserved, foods processed and practices of weaning are presented and discussed in the following pages.

1. Meal Pattern:

a) Kotas: Information on the meal pattern for three days was obtained by recall method. It was found that rice, samai and ganji were the main stay of the diet. The daily food pattern was similar to that of the people in plains. Milk and milk products formed an important part of the diet. This is possible because many of them owned either cow or buffalo. Number of meals per day ranged from four to five.

PLATE V KOTA COMMUNITY WITH THE INVESTIGATOR

PLATE VI KADAR COMMUNITY

4.49 per cent on vegetables other than roots and tubers, 6.65 per cent on nuts and oil seeds and 6.25 per cent on sugar and jaggery.

3. Foods consumed by thetribal communities:

a. Kotas: The Kota's meal pattern was similar to that of people of other non-tribal communities. Rice was found to be the staple cereal. They also consumed samai, ganji and they cultivate a grain called 'Pappari'. Pappari was milled and with the flour they made preparation like 'dosai'. They cultivated many types of greens and consumed them. The greens most commonly found in their diet were Thadi Keerai, Puliari Keerai, Mustard Keerai, colocasia leaves and stem, amaranth etc. They pop the seeds of amaranth and eat the popped seeds as such or with water and sugar. This forms the important food for the children during weaning. The Kotas ate fruits like vikkipazham, korangu pazham, etc. Which are available in the hills. They ate potatos, carrots, turnip cabbage, etc. which they cultivated in their lands. The Kotas purchased from outside the oils and other spices for seasoning.

b. Kadars: The Kadar's staple cereal was rice. However during lean months when rice cannot be procured, they relied on wild roots and tubers available in the forests. The tubers

commonly consumed by them were "Nuran Khizhangu", "Soriyan Khizhangu", "Neer Khzhangu", "Ayana Khzhangu", "Kahal Khizhangu", Vellakodi Khizhangu", "Sandhana Khizhangu", etc. They also collected the bamboo seeds (Kalmoongil rice) whenever it was available and preserved it for future use.

4. Foods given under special conditions:

a. Kotas: Kotas did not have much of the special foods for different special conditions like infancy, weaning pre-school age etc. However during infancy and weaning they included more of ragi, ganji and rice for the reason that these cereals gave more strength. During lactation the special foods included was the extract of a green namely Pulicha Keerai for the reason that it enhances milk secretion and is good for the health of the mother. The food avoided during this stage was 'ganji' for the reason that it is not good for the stomach of the delivered women.

b. Kadars: Kadars gave only mother's milk for infants since that is available in plenty. During weaning they gave rice, kanji, baked roots and tubers. They had the peculiar habit of giving the delivered women red chillie-salt paste in order to clean the uterus and to enhance milk production. During lactation they avoided mango, jack fruit, Ayana Khizhangu and honey for the reason that these are not good for the infant.

There were no other specialfoods during other stages.

5. Diet during illness:

a. Kotas: Kotas smear the paste of neem leaves and small onion for the rashes due to chicken pox. They gave rice kanji and other liquid foods during chicken pox to cool the body. They also avoided hot seasoned foods since it will aggravate the illness. For stomach disorders they gave the extract of a plant namely 'Peimudh' to cure the condition.

b. Kadars: Kadars gave the extract of the roots, ' Kathari manjal', 'amal pori', and 'Koovai Khizhangu' to stop diarrhoea. For chicken pox they gave the water in which rice has been cooked for the reason that it will have cooling effect. During diarrhoea they avoid kanji and water for, these will aggravate the illness.

6. Foods produced at home:

a. Kotas: Among Kotas out of the 20 families surveyed, ø 9 families possessed either cow or buffalo,6 families had kitchen garden in which they cultivated potato, cabbage, greens carrot, radish, etc. and 5 families possessed none of the above. The quantity of produce in excess of the families requirement was sold to the society.

b. Kadars: Among Kadars,out of the 15 families surveyed, only three families had kitchen garden in which two had cultivate

'Kappai Khizhangu' and one had papaya and banana tree. The amount of 'Kappai Khizhangu' produced was only 2-3 kg. once in seven months and the whole amount was used by thefamily. The family which had banana and papaya tree retained some amount for its use and sold the rest.

7. Methods of cooking:

a. Kotas: Kotas cooked cereals,pulses and greens by steaming; tubers by baking and eggs, meat and fish by frying in shallow fat. There was no special method cooking for any particular food.

b. Kadars: Kadars cooked cereals, pulses and greens by steaming, and tubers by baking. Certain foods such as 'Vella Kodi Khizhangu' was eaten in a raw state. Earthernware and aluminium vessels were used for cooking.

8. Foods preserved:

a. Kotas: Kotas preserved products like pickles. The most common pickle was that of Amla. The method of preservation was by adding salt, steaming and then adding mustard-chilli powder paste. It was preserved for a period of 15-22 days. They also preserved ghee for a period of 6 months to 1 year by putting in pots and keeping it aside without handling it often.

b. Kadars: Kadars preserved gooseberries for one year by sundrying and storing. This was used as a substitute for tamarind in cooking. They also preserved moongil rice by storing in hollow cylinders made of bamboo and closing the mouth tightly. In this container the grain can bestored without spoilage for 1- 2 years.

9. Foods processed:

a. Kotas: Kotas did not process any food

b. Kadars: Kadars processed bamboo seeds to get 'moongil rice'. The method of processing was: They made a pit on the ground. The sides of it was set by smearing cow dung. Into the pit the bamboo seeds were put and was pounded with an iron pestle. They did not have any stone or wooden mortar. After pounding they winnowed it to remove the chaffs and stored it in bamboo containers. This method of processing is adapted by Kadars to separate the husk so that keeping quality is improved.

10. Weaning practises:

a. Kotas: The Kotas weaned their children from seventh month onwards. However some mothers did wean their children after 2 years also. The supplementary foods given during weaning were cow's or buffalo's milk, rice, samai and commercial weaning mixtures and commercial drinks such as horlicks, farex etc.

b. Kadars: Kadars weaned their children after eighth month since breast milk is available in plenty until such time. The supplementary foods given during weaning were rice water, mashed roots andtubers, biscuits, mashed vegetables, etc.

D. Nutritive value of the Selected Foods of the Tribal Communities:

Four different types of foods were selected from among the uncommon foods eaten by the Kota community of Nilgiris hills and five different foods were selected from among the uncommon foods eaten by the Kadar community of Anamalai hills. These were subjected to nutrient content analysis using the standard procedures and the results are presented in the following pages.

1. Kota Community:

"Thadi Keerai" and "Puliari Keerai" were the two green leaves selected from the Kota community because in thewinter season these were the only available ones. "Pappari" a food grain and popped amaranth seeds were theother available foods during the winter season and these four food items in all were selected for analysis from the Kota community.

a) Nutrient content of the green leafy vegetables:

Table III gives the nutrient content of the two leafy vegetables "Thadi Keerai" and "Puliari Keerai" consumed by the Kota community.

TABLE III

NUTRIENT CONTENT OF THE SELECTED GREENS OF KOTA COMMUNITY

Nutrients	Thadi Keerai*	Puliari*	Range value for green leafy vegetables ICMR 1981
Energy (Kcals)	94	60	15 - 303
Protein (g)	0.88	4.25	0.6 - 20.7
Fat (g)	2.15	2.13	0.1 - 4.8
Moisture %	90	85	59.4 - 93.7
Total minerals (g)	2.52	2.02	0.6 - 4.5
Calcium (mg)	690.9	131.6	20.0 - 1717
Phosphorus (mg)	184.0	32.0	17 - 462
Ascorbic acid (mg)	77.8	53.6	4 - 247
Crude fibre (g)	0.055	0.1	0.5 - 13.5
Thiamine* (mg)	--	--	-
Riboflavin* (mg)	--	--	-
Iron (mg)	36.4	4.5	0.1 - 68.8
Copper (mg)	9.38	7.58	
Zinc (mg)	40.9	34.8	
Manganese (mg)	21.86	18.9	

* Not analysed due to scarcity of samples.

The energy value of the two greensanalysed were 94.00 and 60.00 respectively, and is well within the reported range of values (15 - 303 Kcals, ICMR, 1981). The protein content of the two samples studied in this investigation were 0.88 and 4.25 g. as against the values of 0.6 - 20.7 g reported in theliterature. Fat contents, moisture contents and total mineral contents were also within the limits reported byICMR (1981). The calcium content of the greens were well within the limits of ICMR (1981) and it may be noted that "Thadi Keerai" has a good amount of calcium. The phosphorus and ascorbic acid contents of the greenswere again within the reported ranges for other greens. The crude fibre content of the greens were less than that reported by ICMR (1981).

The iron content of the two greens were 36.4 and 4.5 mg. and it may be noted that thadi keerai has a good source of iron.

The copper content of thadi keerai and puliari were 9.38mg and 7.58 mg. respectively while the zinc contents were 40.9 and 34.8 mg. respectively. The manganese content of these two samples were 21.86 and 18.90 mg. respectively.

The two greens analysed seems to be like theother commonly used greens of the plains in their nutrient content. Thadi

keerai specially was a good source of calcium and iron. Puliari seems to be a fair source of protein, calcium and trace elements. It would however be interesting to analyse the thiamine, riboflavin and carotene contents of these leaves to further establish their contribution to the Kota diet especially in terms of Vitamin A. It would also be worthwhile to collect the other samples of greens eaten by the community and study their comparative nutritive profile and availability as limited by phytate and other inhibitory factors.

b. Nutrient content of the grains:

"Popped Amaranth Seed" which was consumed like a grain and "Pappari" were the two available sample at the time of collection and the nutrient content of these two grains is presented in Table IV.

TABLE IV

NUTRIENT CONTENT OF THE SELECTED GRAINS OF KOTAS

Nutrients	Popped Amaranth Seeds	Pappari
Energy (Kcals)	391	161
Protein (g)	11.40	4.7
Fat (g)	2.0	9.3
Moisture %	9.25	15.0
Total minerals (g)	1.04	2.89
Calcium (mg)	507.6	701.3
Phospherus (mg)	224	500
Ascorbic acid (mg)	2.54	2.54
Crude Fibre (g)	2.09	1.24
Thiamine (mg)	0.013	0.156
Riboflavin (mg)	0.416	0.111
Iron (mg)	54.5	52.5
Copper (mg)	3.13	3.75
Zinc (mg)	11.25	15.5
Manganese (mg)	3.0	2.5

The nutrient content of the popped amaranth seeds were similar to that of unpopped amaranth seeds in all respects except that of crude fibre and iron . The crude fibre content of the popped amaranth seeds were less than that of unpopped one. The iron content was much higher (54.5 mg) in the popped amaranth seeds than the unpopped one (11 mg.)

The copper, zinc and manganese content of the popped amaranth seeds were 3.13 mg 11.25 mg. and 3.0 mg respectively

The food grain pappari had energy content of only 161 Kcal. which was much less than most of the cereal grains. The protein content of the grain was also less which is on par with that of tender maize. The fat content of the grain was as much as 9.3 g. The food grain has good amounts of calcium phosphorus and iron. The copper, zinc and manganese contents of the food grain were 3.75, 15.5 and 2.5 mg respectively.

The popped amaranth seeds analysed thus seems to have an enhanced iron content and is of great value for it forms one of the major food item of Kotas especially for young weaned children. Hence, its nutritive contribution to the Kota diet is notable. Again the food grain pappari which is one of the most commonly used food grain though lower in its calorific value and protein value it was found to be a good source of iron, calcium,thiamine and riboflavin. This again

has a nutritional significance from the point of view of Kota diet because pappari is one of the important grain item of the Kota diet and when this has has the capacity to enhance the iron, calcium, thiamine and riboflavin contents of the diet, it adds special value in terms of nutritional contribution. It would be interesting to study the availability of these nutrients from their diets to fully establish their nutritional contribution.

2. Kadar Community:

Four tubers namely "Nuran Kizhangu", "Soriyan Kizhangu", Naar Kizhangu" and Ayana Kizhangu" were the available uncommon foods in the season in Anamalai hills and their specially processed "Kalmoongil Rice" was the fifth food item analysed from among the uncommon foods consumed by Kadar community.

a. Nutrient content of tubers:

Table V gives the nutrient content of the four selected tubers of the Kadar community.

TABLE V

NUTRIENT CONTENT OF THE SELECTED TUBERS EATEN BY KADAR COMMUNITY

Nutrients	Khizhangu				Range of values of Roots & Tubers ICMR (1981)
	Nuran	Soriyan	Naar	Ayana	
Energy (Kcals)	121	431	497	283	16--216
Protein (g)	2.25	2.75	1.56	2.63	0.3--7.5
Fat (g)	0.27	0.22	0.25	0.30	0.1--0.9
Moisture %	71.0	68.5	70.0	70.5	44.1--94.9
Total minerals (g)	1.49	2.13	0.93	0.76	0.2--2.6
Calcium (mg)	534	745	324	724	11-520
Phosphorus (mg)	78.4	148	73.6	83.2	7--530
Ascorbic acid (mg)	30.8	64.1	17.9	41.0	0--43
Crude fibre (g)	0.172	0.241	0.194	0.146	0.1--3.6
Thiamine (mg)	0.044	*--	0.022	0.102	0--0.31
Riboflavin (mg)	0.037	*--	0.56	0.6	0.01--0.47
Iron (mg)	2.25	82	100	95	0.4--13.9
Copper (mg)	2.5	42.5	38.3	3.75	
Zinc (mg)	3.0	13.0	13.75	13.75	
Manganese (mg)	0.75	1.67	0.75	1.25	

* Not analysed for B Vitamins due to scarcity of samples.

The energy value of the four tubers selected were 121, 431, 497 and 283 Kcals respectively and the range of values reported for roots and tubers by ICMR (1981) is 16 — 216 Kcals. The energy value of only one tuber, Nuran Khizhangu is within therange reported by ICMR, whereas the other three tubers have got double the amount of energy when compared with the values for energy content of roots and tubers reported by ICMR, 1981.

The protein content of the four tubers as analysed is 2.25, 2.75, 1.56 and 2.63 g. respectively. In general roots and tubers are poor sources of protein and the selected tubers also came well within therange of reported values and very close to the reported protein value of yam and colocasia (2.5, 3.0g.). The fat as estimated for the four selected tubers is 0.27, 0.22, 0.25 and 0.30 g. as against the range of 0.1 - 0.9 g. for roots and tubers in general. The values obtained for fat are quite similar to that of the reported values for carrots.

The percentage moisture for the selected tubers is 71, 68.5, 70 and 70.5 and the range reported by the ICMR (1981) is 44.1 - 94.9. The values obtained for all the tubers are within the range of reported values. The total mineral content as analysed for the four tubers is 1.49, 2.13, 0.93 and 0.76 g. whereas the range reported by ICMR (1981) is 0.2 - 2.6 g. and thus is well within the range.

The calcium content of the four samples are 534, 745 324 and 724mg. as against the range of values of11-520 mg. reported in the literature. Out of four, three samples seems to have a higher calcium content. On theother hand, the Phosphorus content of the four samples were 78.4, 148 73.6 and 83.2 mg. respectively and these values are well within the reported range of values for roots and tubers (7 - 530 mg, ICMR, 1981).

The iron content of the selected four roots and tubers is 2.25, 82, 100 and 95 mg. respectively and except one sample, namely "Soriyan Khizhangu" all the others had values within the range reported (0.43 mg. ICMR 1981). Both thiamine and riboflavin values of the selected tubers were within the range of reported values.

The copper content of the selected tubers were 2.5, 42.5, 38.3 and 3.75 mg. respectively, while the zinc content of the samples are 3.0, 13.00, 13.75 and 13.75 mg. respectively. The Manganese contents of these tubers are 0.75, 1.67, 0.75 and 1.25 mg.

From the above profile of the nutrient content of the four tubers of Kadar community, it is evident that though in many aspects those tubers are very similar to tubers consumed in plains, the higher caloric content, calcium and iron content of three of these tubers is notable. Soriyan

Khizhangu, Naar Khizhangu and Ayana Khizhangu especially seem to be a good source of calories, calcium and iron. The fact that these uncommon tubers form a staple food of this community further emphasise the role played by these tubers in contributing these essential nutrients in Kadar's daily diet. Further investigations in terms of their phytate content and availability of these nutrients would be of immense value.

b. Nutrient content of Kalmoongil rice:

Table VI gives the nutrient content of Kalmoongil rice, the special staple grains of Kadar community.

TABLE VI

NUTRIENT CONTENT OF KALMOONGIL RICE OF KADAR'S

Nutrients	Kalmoongil Rice	Range of values for Cereals ICMR, 1981
Energy (Kcals)	404	125 - 397
Protein (g)	11.5	4.7 - 29.2
Fat (g)	4.6	0.1 - 16.2
Moisture %	12.5	5.2 - 67.1
Total minerals (g)	1.65	0.6 - 4.4
Calcium (mg)	334	9 - 344
Phosphorus (mg)	288	92 - 1410
Ascorbic acid (mg)	6.4	0 - 6
Crude fibre(g)	0.98	0.2 - 9.8
Thiamine (mg)	0.217	0.06 - 2.70
Riboflavin (mg)	0.095	0.01 - 0.54
Iron (mg)	52.5	1.1 - 35.0
Copper (mg)	3.75	-
Zinc (mg)	13.75	-
Manganese (mg)	1.88	-

The cereal Kalmoongil rice which the Kadar community collect and eat with very great interest is high in calories than any other cereals. The protein content is also significant and it amounts to 11.5 g. The fat content is 4.6 g and this amount comes within the range of values for other cereals (ICMR, 1981).

The cereal has a good amount of calcium and phosphorus The iron content of this cereal is very high and it amounts to 52.5 mg. It has fair amounts of thiamine and riboflavin. The ascorbic acid content of the cereal is 6.4 mg. and it is to be noted that no other cereal has ascorbic acid except tender maize, which also contains only 6 mg.

The copper, zinc and manganese contents of the cereal grain is 3.75, 13.75 and 1.88 mg. respectively.

It is notable that this special grain consumed with great interest and more or less as a staple by Kadars is a specially processed grain peculiar to this community. The nutritional contribution of this grain in terms of calories, protein, calcium and iron is notable and processing could have enhanced atleast calcium and iron content. The nutrient contribution of this processed grain to Kadar's diet is remarkable and further studies to throw more light on its nutrient contribution in terms of availability, enhancement

due to special processing etc. and actual dietary contribution through diet surveys are recommended.

It may be noted from the foregoing paragraphs that the Kota community living in Nilgiris mostly consumed the same kinds of foods as eaten in the plains. They have access to many foods available in their hilly abodes which are uncommon on the plains. Since it was the winter season during which the study was conducted many roots and tubers uncommon in plains were not available. Hence, it was feasible to identify only two greens and two other foods which are common items of their food.

Kadar community of Anamalai hills also consumed the same kinds of foods as eaten in the plains when they are able to procure them. During lean months they go to the interior of forests to hunt for wild roots and these form their main diet. The physique of the Kadar itself reveal that they must be consuming nutritious foods.

It has been revealed by this study that the foods selected among the uncommon foods eaten by the Kadar community is especially high in calories, calcium and iron which might be the cause for their good physique.

Further studies to explore the other foods available during other seasons of the year is recommended. Simultaneous studies on nutrient analysis and nutritional status evaluation is suggested in theother pockets of Kota and Kadar communities so as to obtain a full picture of their food pattern and nutritional status. Nutrient availability studies are also recommended to correlate with the nutritional profiles of these communities.

Summary and Conclusion

V. SUMMARY AND CONCLUSION

The main objective of this investigation was to study the dietary pattern of Kota and Kadar communities of Nilgiris and Anamalai hills respectively, and to evaluate the nutritive value of selected foods eaten by Kota and Kadar communities.

A dietary survey was carried out among the two communities, with a representation of 20 families from Kota community and 15 families from Kadar community. The dietary survey elicited informationon the family background, dietary pattern and foods consumed during special condition and illness. The survey also revealed that two greens namely 'Thadi Keerai and Puliari' and two other foods namely'Popped amaranth seeds' and 'Pappari' are among the many uncommon foods eaten by the Kota community. Four tubers namely 'Nuran Khizhangu', 'Soriyan Khizhangu'; 'Naar Khizhangu' and 'Ayana Khizhangu' and 'Kalmoongil rice' a commonly consumed processed grain were the five uncommon foods eaten by Kadarcommunity. Hence nine foods in all which were readily available in the winter season were selected for analysis of nutrients using the standard procedures.

The results of this investigation are summaried as follows:

1. The Kotas live in seven villages situated in the Nilgiris Hills. Of these a typical representation of

eaten by Ketas were 'Popped amaranth seeds' and 'Pappari', while there were other uncommon foods these were the only four foods available in winter. Among the most common roots and tubers consumed by Kadars 'Nuran Khizhangu', 'Soriyan Khizhangu', 'Naar Khizhangu' and 'Ayana Khizhangu' were the available one in the winter season and 'Kalmoongil rice' was also available. Thus the nine foods available were selected for analysis.

5. The nutritive value of the two greens selected 'Thadi Keeri' and 'Puliari' were well within the range of values reported by ICMR (1981) for the commonly used greens of the plains.

6. The nutritive value of the four tubers selected were within the range of values reported by ICMR (1981) for all the nutrients excepting for calories, calcium and iron. Out of the four tubers studied three tubers namely 'Soriyan Kizhangu', 'Naar Kizhangu' and 'Ayana-kizhangu' had higher levels of calories, calcium and iron.

7. The nutritive value of popped amaranth seed was similar to that of unpopped seeds except with regard to iron content which was higher in popped seeds than unpopped seeds. The foodgrain Pappari did not have much

of calories and proteins but had a good amount of iron and calcium and a fair amount of fat. The 'Kalmoongil rice' was found to be a very good source of calories, calcium and iron.

The Kotas of Nilgiris hills thus consumed the same varieties of main foods as people in the plains, but they included a good amount of milk and milk products as it was available readily at home. This might be responsible for their better nutritional status as judged by their appearance by the investigator. Kadars who completely omitted milk and milk products from their diets had a good physique which shows that their diet must be nutritious. Then observations on the tribal communities correlated well with the nutritive value of the uncommon foods analysed in this investigation. The fact that the grains consumed by the Kotas and the tubers consumed by Kadars had higher calories, iron and calcium contents indicate the nutritional contribution of those uncommon foods to their dietaries. Inspite of the fact that Kadars excluded milk and milk products from their diet, the fact that the processed special grain-"Kalmoongil rice" was a richers source of proteins, calcium and iron and which forms the main stay of their diet indicates that those uncommon foods enhance the nutritive value of their diets.

While this investigation has given a probe into the nutritive value of some selected uncommon foods eaten by Kota community of Nilgiris and Kadar community of Anamalais, it isrecommended that further studies are carried out in all the pockets where Kotas and Kadars live in Tamil Nadu, and all foods available in all seasons be analysed to get a complete picture. Studies based on nutritional status evaluation and uncommon food analysis and medicinal herb analysis is recommended simultaneously to give a complete picture on the nutritional profiles of these communities. It is also recommended that while the uncommon foods as observed in this investigation seems to be a good source of iron and calcium further studies on all the uncommon foods eaten by these communities with regard to their nutritive value, availability of nutrients and correlate them with their nutritional profile is recommended.

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Appendices

APPENDIX I

INTERVIEW SCHEDULE TO ELICIT INFORMATION REGARDING THE FOOD HABITS

1. Name of the place :
2. Name of the Interviewer :
3. Name of the interviewee :
4. Sex :
5. Age :
6. Caste :
7. Religion :
8. Occupation :
9. Monthly Income :
10. Address :
11. Type of family : Joint ☐ Nuclear ☐
12. Family background

Name of family members	Sex	Age	Relation ship to the head of the family	Marital status	Education Status			Occupation	Monthly income
					studied upto	Studying in	Illeterate		

13. Health and dietary Practices: Vegetarian ☐
    Vegetarian but takes egg ☐ Non-vegetarian ☐

14. Food Pattern:

	I Day	II Day	III Day
Early Morning			
Breakfast			
Lunch			
Tea			
Dinner			

15. Staple cereal

16. Which are the foods that you take in a raw state?

17. Food expenditure pattern:

Foods	Amount spent per month
Cereals	
Pulses	
Green Leafy Vegetables	
Other Vegetables	
Roots and Tubers	
Fruits	
Nuts and Oil Seeds	
Sugar and jaggery	
Fleshy Foods	
Milk and its products	

18. Foods given under special conditions:

Conditions	Special foods given	Reasons	Foods Avoided	Reasons
Infancy				
Weaning				
Pre-school age				
School going age				
Adolescents				
Pregnancy				
Lactation				
Old Age				
Sickness(Specify				

19. Diet during illness

Illness	Foods given	Reason	Foods avoided	Reasons
Fever				
Diarrhoea				
Chickenpox				
Cold				
Others				

20. Foodss produced at home: Kitchen gardent ☐

Do you possess any of the following? Poultry ☐

Dairy ☐

If yes:

Items	Production/day number of value	Use of produce by the family	Gift or Sale

21. Methods of cooking:

Food Items	Baking	Steaming	Frying deep fat	Frying shallow fat	Roasting
Cereals					
Pulses					
Greens					
Tubers					
Eggs					
Meat					
Fish					
Others					

22. Foods preserved:

Food	Method of preservation	Period over which preserved	Preserved food purchased from outside

23. Is there any special method of cooking for any particular food?

Yes ☐ No ☐

Reasons:

24. Foods processed:

Food	Method of processing	Reasons

25. Weaning:

Order of child	Age of Weaning	Supplementary Foods given	Reasons
I Child			
II Child			
III Child			

APPENDIX II

ESTIMATION OF IRON AND TRACE ELEMENTS

One gram of the sample to be analysed was digested with 10ml of triple acid (Nitric, Sulphuric, and Perchloric acids in the ratio of 9 : 2 : 1) and made upto 50 ml. The made up sample was then fed into the Atomic absorption spectro photometer for the analysis of Iron, Copper, Zinc and Manganese.