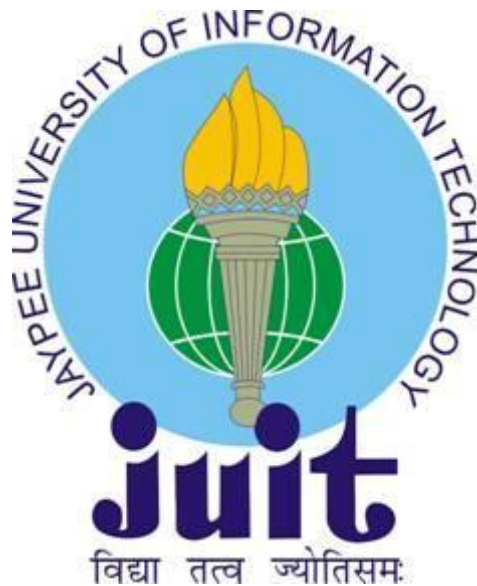


NUTRITIONAL ANALYSIS OF TRADITIONAL FOODS OF NORTH WEST HIMALAYAN REGIONS

BY- (101722) DIVYA DOGRA

UNDER THE SUPERVISION OF DR. GARGI DEY



Submitted in partial fulfillment of the Degree of
Bachelor of Technology

DEPARTMENT OF BIOTECHNOLOGY AND
BIOINFORMATICS

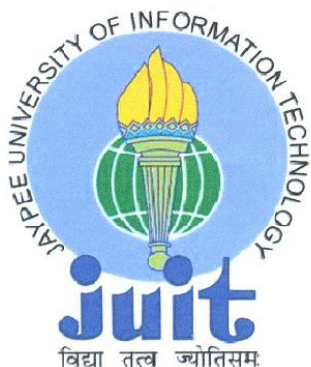
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CERTIFICATE

This is to certify that the work titled “**Nutritional analysis of traditional foods of north west Himalayan regions**” submitted by “**Ms Divya Dogra (101722)**” in the partial fulfillment for the award of degree of Bachelor of Technology (Biotechnology) of Jaypee University of Information Technology, Waknaghat has been carried out under my supervision. This work has not been submitted partially or wholly to any other university or institution for the award of this or any other degree or diploma.


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It was a great opportunity for me that the Biotechnology department handed me over such an innovative project which could have not been possible without the help and support of my guide Dr. Gargi Dey. This project not only helped in understanding the nutritional facts about food but also helped me to understand the value of a healthy diet. Through this project I learned about the different types of traditional foods that are consumed across North-West Himalayan region and also was able to estimate the phenolic and the antioxidant contents in different types of traditional food.

I would like to thank all my friends for their constructive criticism during this project period. Finally, I am very much indebted to my parents for their moral support and encouragement to achieve higher goals. I have no words to express my gratitude and still I am very thankful to my parents who have given me their support .


Signature of Student

Name: Divya Dogra

Date.

SUMMARY

The food habits of the people have changed these days but those who have their roots in the villages, still relish the traditional recipes prepared from seasonal plant materials. These recipes are losing its sheen in the fast food culture. So there is a need to conserve our traditional food habits and recipes. The plant material used for preparing these recipes is seasonal and completely organic. It is both nutritious and safe to eat thus healthy.

In the present study we surveyed 10, different villages of district Hamirpur (Bhoni, Mulwana, Guddi, Tropka, Kangru, Broha, Dugga, Gsota, Lambhluand Bassi). From the data we concluded that there were no families who were consuming any kind of junk food or fast food. Families in village generally grew their own seasonal vegetables, wheat, rice, corn, mustard for oil and some of the legumes in their fields without using any pesticides and consumed the same throughout the year. They also consumed seasonally available indigenous vegetables and fruits.

From the survey data, the recommended dietary allowance (RDA) was calculated for different families and for different age groups and both the sexes. It was found that none of the families were nutritionally deficient and they were consuming a balanced diet.

In order to evaluate the prophylactic effects of the indigenous vegetables and fruits sample collection was done. There were eight samples which were collected:- Citrus lumia, Citrus pseudolemon, Rhododendron arboreum squash, Buckwheat flour, Rhododendron arboreum flowers, Ficus carica, Amaranths seeds and buckwheat seeds. They were subjected to Total Phenolic Content, DPPH assay and ABTS assay.

The observed results for Total Phenolic Content were in this order Citrus lumia < Ficus carica < Amaranths seeds < Citrus pseudolemon < Buckwheat flour < Buckwheat seeds < Rhododendron arboreus squash < Rhododendron flowers.

For DPPH assay the results were observed in this order Amaranths seeds < Ficus carica < Rhododendron arboreus squash < Buckwheat flour < Buckwheat seeds < Rhododendron flowers < Citrus pseudolemon < Citrus lumia.

For DPPH assay the results were observed in this order Amaranths seeds < Ficus carica < Rhododendron arboreus squash < Buckwheat flour < Buckwheat seeds < Rhododendron flowers < Citrus pseudolemon < Citrus lumia.

And for ABTS assay the results were observed in this order Amaranths seeds < Ficus carica < Rhododendron arboreus squash < Buckwheat flour < Buckwheat seeds < Rhododendron flowers < Citrus pseudolemon < Citrus lumia.


Signature of Student

Name: Divya Dogra

Date:


Signature of Supervisor

Name: Dr Gargi Dey

Date: 23.05.2014

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1: INTRODUCTION

There are a number of traditional food products that are prepared and consumed in Himachal Pradesh and the types of traditional food products of Himachal are unique and very different from other areas. The cuisines of Himachal have been developed keeping in mind the geographical and climatic conditions of the state, as agriculture is difficult in the hilly region and generally the climate remains cold throughout the year. So that is why the cuisine is modified in the manner that it provides heat and energy to the people, to the maximum .

The staple food of the people of Himachal Pradesh rice, wheat, corn, maize but we can see local variations due to the altitude and climatic difference, e.g. in the barren regions of Lahaul spiti and Kinnaur, the local people prefer consuming the products made from coarse grains like Buckwheat, Millets, Barely as the main substrate, whereas in the lower regions of the state like Kangra, Hamirpur, Bilaspur people prefer consuming *roties* which are made from rice, maize, corn and wheat flour .in regions where pasture is dominant, milk and milk products are widely used. Irrespective of the altitude and climatic difference, people have a specific liking towards non-vegetarian food items which are cooked with generous doses of spices and ghee.

The traditional meal of Himachal Pradesh is the usual boiled rice *roti/chappati*, dishes of vegetables like *sabzi* and dal there are special food preparation which have been developed for ceremonial occasions as well as for paediatric and other purposes. The local people are consuming these dishes from centuries and these form a part of socio-cultural life of hill people. But due to modernization in the food habits all these old traditions of food preparations are on the verge of disappearance. So there should be an effort made to elaborate some of the recipes from the endless list of dishes prepared and try to understand the nutritional facts about the traditional food items which may result in providing some useful information about them.

Antioxidants are very essential substances which possess the ability to protect the body from damage which is caused by free radical induced oxidative stress. Epidemiological studies have shown that intake of fruits and vegetables have the ability to inhibit the damaging behaviour of free radicals in the human body. This may be because of the presence of natural antioxidants such as vitamin C, tocopherols, carotenoids, polyphenolics and flavonoids which prevent free radical damage. The antioxidant property of phenolics is due to their redox properties. Phenols act as

reducing agents, hydrogen donors, singlet oxygen quenchers and metal chelators. Vitamin C (Ascorbic acid) is the most important vitamin which is present in fruits and vegetables. Except human and other primates, all most all the phylogenetically higher animals can synthesize their own vitamin C (*L-ascorbate*). More than 90% of the vitamin C in human diets is supplied by fruits and vegetable. Vitamin C is required for prevention of scurvy and maintenance of healthy skin, gums and blood vessels. It has a role in collagen formation, absorption of inorganic iron, reduction of plasmacholesterol level, inhibition of nitrosoamine formation, enhancement of the immune system, and reaction with singlet oxygen and other free radicals. As an antioxidant, it has been reported to reduces the risk of arteriosclerosis, cardiovascular diseases and some forms of cancer. The consumption of fruit juices is beneficial and the health effects of fruits are described as, in part to ascorbic acid, a natural antioxidant which may inhibit the development of major clinical conditions including cardiovascular diseases and cancer. Many fruit juices and vegetables also contain phenolic compounds and carotenoids which have antioxidant potential and intake of such fruits and vegetables is beneficial.

The work was divided into two parts, the first part consisted of a survey which was taken in different districts of Himachal Pardesh. The survey was conducted in 10 different villages of districts Hamirpur, Kangra, Una and Mandi. This survey was done and reported for 100 different families. Survey was conducted so as to see the food habits of the people living in the villages and whether or not they are consuming a balanced diet or not as for now only the people living in the villages are in touch with the local traditions and also consume the traditional cuisines. So the best way to learn their food habits was to conduct a survey.

The second part was the collection of the samples from different districts of Himachal Pardesh so estimation of total phenolic content and antioxidant in the samples. Only traditional food products were collected in raw form and estimations were carried out. 8 different samples were collected from different regions of Himachal in accordance to the availability and climate as traditional fruits and vegetables are seasonal and available for short duration of time.

2: AIM OF THE STUDY

- 1. Through surveys we tried understanding the food habits of the people living in the North – West Himalayan region.**
- 2. Estimation of the Total Phenolic Content in the samples collected.**
- 3. Estimation of antioxidant content in the samples collected with the help of two radical free scavenging assays:**
 - (a). DPPH(2,2-Diphenyl-1-picrylhydrazyl)**
 - (b). ABTS(2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid))**

3: REVIEW OF LITURATURE

Himachal Pradesh presents anthropological, cultural, environmental and topographical diversity. Its reflection is seen in the variations of architecture of houses, clothing styles, food and food habits. The variations in availability of raw materials, environmental conditions clubbed with the time tested traditional knowledge and wisdom have made the people of different regions of this hill state to formulate, develop and perpetuate the consumption of a wide range of traditional foods and beverages unique to its places since ages. Bhatooru, siddu, marchu, seera, chilra, manna, aenkadu, sepubari, patande, doo, baari, dosha, malpude, babroo, bedvin roti, madrah, tchati, churpa, sura, chhang, kinnauri, angoori, chulli, lugri, arak/ara, rak, chukh and pickles (e.g. brinjal, lingri, bidana, peach, pear, plum, tomato, bottle gourd, etc.) made from different fruits and vegetables, etc. are some popular traditional products that are unique to the tribal and rural belts of Himachal Pradesh. Some of these products, e.g. bhatooru, chilra and tchati constitute staple food in rural areas of the state while others are prepared and consumed during marriages, local festivals and special occasions, and form part of the sociocultural life of hill people. However, the production of these foods and beverages is largely limited to household level.

Antioxidants are vital substances which possess the ability to protect the body from damage caused by free radical induced oxidative stress. Epidemiological studies specify that intake of fruits and vegetables have the ability to inhibit the damaging behavior of free radicals in the human body. In this study, we assessed antioxidative properties of the ethanolic extracts of *Buckwheat* flour, *Rhododendron arboreum* flowers, *Ficus carica*, *Amaranths* seeds and *Buckwheat* seeds. The ethanolic extracts were studied for phenolic content and antioxidant properties by different in-vitro experiments including DPPH radical assay, ABTS radical assay, Total Phenolic content for gallic acid equivalents. Results:

The total phenolic content to antioxidant activity of fresh juices of *Citrus lumia*, *Citrus pseudolemone*, *Rhododendron arboreum* squash were estimated. The fruits were collected from local market and the pulp and seed free juices were collected. Total phenolic content of fresh fruit juices were determined by Folin-Ciocalteu reagent method. Antioxidant activity of fruit juices was

determined by two *in vitro* assays namely DPPH free radical scavenging assay and ABTS scavenging assay.

Antioxidative activities and total phenolic content of buckwheat flours, buckwheat seeds and amaranths seeds were tested using 1,1-diphenyl-2-picrylhydrazyl (DPPH·)-scavenging activity and ABTS scavenging activity. The content of the total phenolics of ethanolic extracts was estimated. Polyphenolics content (expressed as gallic acid equivalent, GAE) in wheat flours varied between 37.1 and 137.2 mg GAE/g extract, while its content in buckwheat flour were at least four time higher and ranged between 476.3 and 618.9 mg GAE/g extract. Ethanolic extracts of buckwheat flours exhibited higher antioxidant activities in both the assays, except for. Regarding all the obtained results, it can be concluded that bakery products produced with buckwheat flour could be regarded as potential functional foods.

The flowers of *Rhododendron arboreum* have been reported to possess certain polyphenolic compounds so were tested using 1,1-diphenyl-2-picrylhydrazyl (DPPH·)-scavenging activity and ABTS scavenging activity. . Total phenolic content of flower were determined by Folin-Ciocalteu reagent method.

4: MATERIALS AND METHODS

4.1: Materials

8 different samples from different districts of Himachal Pradesh were collected and estimated for phenolic and antioxidant contents.

4.1.1 Study subject:

- 1) Citrus lumia
- 2) Citrus pseudolemone
- 3) Rhododendron arboreum squash
- 4) Buckwheat flour
- 5) Rhododendron arboreum flowers
- 6) Ficus carica
- 7) Amaranths seeds
- 8) Buckwheat seeds

4.1.2 Chemicals required:

- 1) Folin-Ciocalteu reagent
- 2) Sodium carbonate
- 3) Ethanol
- 4) 1,1-Diphenyl-2-picrylhydrazyl (DPPH)
- 5) 2,2'-azino-bis(3-ethyl benzothiazoline-6-sulphonic acid (ABTS)
- 6) Potassium per sulphate

Spectrophotometric Measurements

Spectrophotometric measurements were performed by UV-VIS Double Beam Spectrophotometer (ELICO SL-210).

Soxhlet apparatus

This apparatus was used for preparation of extract from different samples.

4.2: Survey form



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WAKNAGHAT, SOLAN

SURVEY ON NUTRITION CONSUMED BY VILLAGERS OF KANDAGHAT, SOLAN
and WAKNAGHAT

Name:

Name of the Village:

Number of members in the family:

Monthly Income:

Food items consumed in Breakfast:

Food items consumed in Lunch:

Food items consumed in Dinner:

Any diseases:

Medication:

NUTRIENT	RECOMMENDED DIETRY AMOUNT	AMOUNT PRESENT IN THEIR DIET
PROTEIN		
CARBOHYDRATE		
FAT		
VITAMINS & MINERALS		
CALORIES		

Deficient diet YES NO

Balanced diet YES NO

Signature of the respondent

4.3: Methods

Survey was conducted in 10 different villages of districts Hamirpur, Kangra, Una and Mandi. This survey was done and reported for 100 different families.

4.3.1: Preparation of extract

For samples like *Citrus limonia* and *Citrus pseudolemon* the fruits were washed thoroughly in water. The juices were extracted by cutting the fruits in half and carefully squeezing to extract juices. The collected juices were filtered through 4-fold filter paper and the pulp free juice was collected in clean air tight containers.

A readymade bottle of squash was purchased from the market in case of the sample of *Rhododendron arboreum* squash..

For samples like Buckwheat flour, *Rhododendron arboreum* flowers, *Ficus carica*, Amaranths seeds and Buckwheat seeds Soxhlet method was used for preparation of extract. All the samples were dried in the oven grinded into powder form sieved and stored in air tight plastic bags so that they can further be used for extraction.

In soxhlet method the dried sample was taken in a filter paper and a thimble was formed which is loaded into the main chamber of the Soxhlet extractor. The extraction solvent which is to be used is taken into a distillation flask and the Soxhlet extractor is placed onto this flask. The Soxhlet is then equipped with a condenser for condensation of the vapours produced when the apparatus is switched on and boiling of the sample starts taking place . In the case of these samples the extraction solvent used is ethanol for all the samples. After obtaining the extract it was subjected to rotary evaporator to obtain dried extract which can be stored for further analysis.

4.3.2: Estimation of Total Phenolic Content

Total phenolic content were quantified and expressed as Gallic acid equivalents. The extract was taken in different concentrations in four test tubes for the estimation of phenolic content with the help of Folin-Ciocalteu method. To different concentration of extract 275 μ l, 250 μ l, 225 μ l and 2000 μ l of distilled water was added respectively and 500 μ l of Folin-Ciocalteu reagent(1:1) was added to each test tubes then they were incubated at room temperature for 3minutes and 2000 μ l of sodium carbonate was added to each tube and again the test tubes were incubated in boiling water for 1minute. Then the O.D. was taken at 650 nm. The experiment was done in triplicates.

4.3.3: Determination of Antioxidant capacity

(a) DPPH Radical Scavenging Activity

DPPH reagent was formed by mixing 20g of DPPH in 1000ml of ethanol and kept for incubation for 48 hrs in dark. Then different concentration of extracts was taken in a test tube to them 800µl, 600µl, 400µl, 200µl and 0µl of ethanol was added. To the test tubes then 3000µl of DPPH reagent was added and incubated at room temperature for 30 minutes in dark. Then the O.D. was taken at 734nm.. BHT was used as a control. The experiment was done in triplicates. The estimation of the scavenging activity was done with the help of the following formula:

$$I (\%) = 100 \times (A_0 - A_1) / A_0$$

Where A₀ is the absorbance of the control, A₁ is the absorbance of the extract/standard, respectively.

(b) ABTS radical scavenging Activity

The ABTS radical cation preparation: ABTS 2 mM (0.0548 gm in 50 ml) was prepared in ethanol. Potassium per sulphate 70 mM (0.0189g in 1ml) was prepared in ethanol. 200 µl of potassium persulphate and 50 ml of ABTS were mixed and used after 42 hrs. This solution was used for the assay. Then different concentration of extracts was taken in a test tube to them 800µl, 600µl, 400µl, 200µl and 0µl of ethanol was added. To the test tubes then 3000µl of ABTS reagent was added and incubated at room temperature for 30 minutes in dark. Then the O.D. was taken at 734nm.. BHT was used as a control. The experiment was done in triplicates. The estimation of the scavenging activity was done with the help of the following formula:

$$I (\%) = 100 \times (A_0 - A_1) / A_0$$

Where A₀ is the absorbance of the control, A₁ is the absorbance of the extract/standard, respectively.

5: Results

5.1: Survey tables

Table 5.1(a): Survey table for Bohni village

Village	Breakfast			Lunch			Dinner	
	Adults	Children		Adults	Children		Adults	Children
1.	6[M(3), F(3)]							
	Wheatchappati(250gm vegetable(250gms), milk(250gms), curd(100gms)			Dal(300gms) rice(400gms), Curd(100gms), Vegetable(250gms)			Dal(300gms), Vegetable(500gms), Roti(250gms), Milk(1000gms)	
2.	4[M(2),F(1)]	1						
	Vegetable(700gms), Chappati(500gms), Curd(250gms), Milk(500gms)			Dal(300gms), Rice(500gmg), Curd(250gms)			Vegetable(700gms), Roti(700gms), Milk(500gms)	
3.	6[M(3), F(2)]	1						
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
4.	10[M(4), F(3)]	3						
	Cornchappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
5.	6[M(2), F(2)]	(2)						
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
6.	6[M(4),F(2)]							
	Wheatchappati(250gms), vegetable(250gms), milk(250gms), curd(100gms)			Dal(300gms) , rice(400gms), Curd(100gms), Vegetable(250gms)			Dal(300gms), Vegetable(500gms), Roti(250gms), Milk(1000gms)	
7.	10[M(4), F(4)]	2						
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
8.	4[M(1), F(2)]	2						

	Vegetable(700gms), Chappati(500gms), Curd(250gms), Milk(500gms)		Dal(300gms), Rice(500gms), Curd(250gms)		Vegetable(700gms), Roti(700gms), Milk(500gms)
9.	6[M(3), F(2)]	1			
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gms), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)
10.	6[M(2), F(2)]	2			
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gms), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)

Table 5.1(b): Survey table for Mulwana village

Village	Breakfast		Lunch		Dinner	
	Adults	Children	Adults	Children	Adults	Children
1.	10[M(4), F(2)]	4				
	Cornchappati(1500gms), Buttermilk (2000gms), Milk(600gms)		Dal(500gms), Rice(400gms), Curd(500gms)		Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
2.	6[M(3), F(3)]					
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gms), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
3.	6[M(2), F(2)]	2				
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gms), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
4.	6[M(3), F(2)]	1				
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gms), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
5.	6[M(3), F(3)]					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gms), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
6.	14[M(4), F(4)]	6				
	Corn chappati(2500gms), Buttermilk (2000gms), Milk(1000gms)		Dal(700gms), Rice(500gms), Curd(800gms)		Vegetable(4000gms), Roti(3000gms), Milk(1000gms)	
7.	10[M(4),	2				

	F(4)]						
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)
8.	6[M(3), F(2)]	1					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
9.	6[M(3), F(3)]						
	Wheatchappati(250gms), vegetable(250gms), milk(250gms), curd(100gms)			Dal(300gms) , rice(400gms), Curd(100gms), Vegetable(250gms)			Dal(300gms), Vegetable(500gms), Roti(250gms), Milk(1000gms)
10.	6[M(2), F(4)]						
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)

Table 5.1(c): Survey table for Guddi village

Village	Breakfast			Lunch			Dinner	
Guddi	Adults	Children		Adults	Children		Adults	Children
1.	10[M(4), F(4)]	2						
	Cornchappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
2.	6[M(3), F(2)]	1						
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
3.	6[M(2),F(2)]	2						
	Wheatchappati(250gms), vegetable(250gms), milk(250gms), curd(100gms)			Dal(300gms) , rice(400gms), Curd(100gms), Vegetable(250gms)			Dal(300gms), Vegetable(500gms), Roti(250gms), Milk(1000gms)	
4.	10[M(3), F(3)]	4						
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
5.	6[M(3), F(3)]							
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
6.	6[M(3),	2						

	F(1)]						
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
7.	10[M(4), F(4)]	2					
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)
8.	6[M(3), F(2)]	1					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
9.	6[M(3), F(3)]						
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
10.	6[M(2), F(2)]	2					
	Corn chappati(1000gms), Buttermilk(1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)

Table 5.1(d): Survey table for Tropka village

Village	Breakfast			Lunch			Dinner	
Tropk	Adults	Children		Adults	Children		Adults	Children
1.	7[M(3), F(2)]	(2)						
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
2.	8[M(3), F(3)]	(2)						
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
3.	5[M(3), F(2)]							
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
4.	7[M(3), F(2)]	(2)						
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
5.	8[M(3), F(3)]	(2)						

	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
6.	10[M(4), F(3)]	3					
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)
7.	6[M(3), F(3)]						
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
8.	6[M(2), F(4)]						
	Wheat chappati(250gms), vegetable(250gms), milk(250gms), curd(100gms)			Dal(300gms) , rice(400gms), Curd(100gms), Vegetable(250gms)			Dal(300gms), Vegetable(500gms), Roti(250gms), Milk(1000gms)
9.	10[M(4), F(4)]	2					
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)
10.	6[M(2), F(2)]	(2)					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)

Table 5.1(e): Survey table for Kangru village

Village	Breakfast			Lunch			Dinner	
	Adults	Children		Adults	Children	Total	Adults	Children
1.	10[M(3), F(3)]	4						
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
2.	5[M(3), F(2)]							
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
3.	4[M(2), F(2)]							
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
4.	12[M(4),	4						

	F(4)]						
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)
5.	6[M(2), F(2)]	(2)					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
6.	7[M(3), F(2)]	(2)					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
7.	6[M(2), F(2)]	(2)					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
8.	10[M(4), F(4)]	2					
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)
9.	6[M(3), F(3)]						
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
10.	6[M(2), F(2)]	(2)					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)

Table 5.1(f): Survey table for Broha village

Village	Breakfast			Lunch			Dinner	
	Adults	Children		Adults	Children		Adults	Children
1.	6[M(2), F(2)]	(2)						
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
2.	7[M(3), F(2)]	(2)						
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
3.	6[M(3),							

	F(3)]						
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
4.	4[M(2), F(2)]						
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
5.	10[M(4), F(4)]	2					
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)
6.	6[M(2), F(2)]	(2)					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
7.	12[M(4), F(4)]	4					
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)
8.	7[M(3), F(2)]	(2)					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)
9.	6[M(3), F(3)]						
	Wheat chappati(250gms), vegetable(250gms), milk(250gms), curd(100gms)			Dal(300gms) , rice(400gms), Curd(100gms), Vegetable(250gms)			Dal(300gms), Vegetable(500gms), Roti(250gms), Milk(1000gms)
10.	6[M(2), F(2)]	(2)					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)

Table 5.1(g): Survey table for Dugga village

Village	Breakfast			Lunch			Dinner	
Dugga	Adults	Children		Adults	Children		Adults	Children
1.	9 [M(4), F(3)]	2						
	Cornchappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
2.	7[M(3), F(2)]	(2)						

	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)
3.	4[M(2), F(2)]					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)
4.	5[M(3), F(2)]					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)
5.	6[M(2), F(2)]	(2)				
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)
6.	7[M(3), F(2)]	(2)				
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)
7.	8[M(3), F(3)]	(2)				
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)
8.	10[M(4), F(3)]	3				
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)		Vegetable(3000gms), Roti(2000gms), Milk(500gms)
9.	6[M(2),F(4)]					
	Wheatchappati(250gms), vegetable(250gms), milk(250gms), curd(100gms)			Dal(300gms) , rice(400gms), Curd(100gms), Vegetable(250gms)		Dal(300gms), Vegetable(500gms), Roti(250gms), Milk(1000gms)
10.	4[M(2), F(1)]	1				
	Vegetable(700gms), Chappati(500gms), Curd(250gms), Milk(500gms)			Dal(300gms), Rice(500gmg), Curd(250gms)		Vegetable(700gms), Roti(700gms), Milk(500gms)

Table 5.1(h): Survey table for Gsota village

Village	Breakfast		Lunch		Dinner	
	Adult	Children	Adults	Children	Adults	Children
1.	6[M(2), F(2)]	(2)				
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
2.	6[M(3), F(3)]					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
3.	6[M(3), F(2)]	(1)				
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
4.	10[M(4), F(4)]	2				
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)		Dal(500gms), Rice(400gmg), Curd(500gms)		Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
5.	6[M(2), F(2)]	(2)				
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
6.	5[M(3), F(2)]					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
7.	12[M(4), F(4)]	4				
	Corn chappati(1500gms), Buttermilk (2000gms), Milk(600gms)		Dal(500gms), Rice(400gmg), Curd(500gms)		Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
8.	5[M(3), F(2)]					
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
9.	6[M(2), F(2)]	(2)				
	Corn chappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
10.	10[M(3), F(3)]	4				
	Corn chappati(1500gms),		Dal(500gms),		Vegetable(3000gms),	

	Buttermilk (2000gms), Milk(600gms)		Rice(400gmg), Curd(500gms)		Roti(2000gms), Milk(500gms)
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Table 5.1(i): Survey table for Lamblhu village

Village	Breakfast			Lunch			Dinner	
	Adults	Children		Adults	Children		Adults	Children
1.	11[M(5), F(5)]	1						
	Cornchappati(1500gms) Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
2.	5[M(3), F(2)]							
	Cornchappati(1000gms) Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
3.	6[M(3), F(3)]							
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
4.	6[M(2), F(2)]	(2)						
	Cornchappati(1000gms) Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
5.	6[M(2), F(2)]	(2)						
	Cornchappati(1000gms) Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
6.	12[M(5), F(5)]	2						
	Cornchappati(1500gms) Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
7.	6[M(4), F(2)]							
	Cornchappati(1000gms) Buttermilk (1000gms), Milk(500gms)			Dal(250gms), Rice(350gmg), Curd(500gms)			Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
8.	10[M(4), F(4)]	2						
	Cornchappati(1500gms) Buttermilk (2000gms), Milk(600gms)			Dal(500gms), Rice(400gmg), Curd(500gms)			Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
9.	6[M(3), F(3)]							
	Cornchappati(1000gms) Buttermilk (1000gms),			Dal(250gms), Rice(350gmg),			Vegetable(2000gms), Roti(1000gms),	

	Milk(500gms)		Curd(500gms)		Milk(500gms)
10.	6[M(2)F(4)]				
	Wheatchappati(250gm), vegetable(250gms), milk(250gms), curd(100gms)		Dal(300gms) , rice(400gms), Curd(100gms), Vegetable(250gms)		Dal(300gms), Vegetable(500gms), Roti(250gms), Milk(1000gms)

Table 5.1(j): Survey table for Bassi village

Village	Breakfast		Lunch		Dinner	
Bassi	Adults	Children	Adults	Children	Adults	Children
1.	5[M(3), F(2)]					
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
2.	7[M(3), F(2)]	(2)				
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
3.	6[M(2), F(2)]	(2)				
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
4.	6[M(3), F(3)]					
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
5.	13[M(5), F(5)]	3				
	Cornchappati(1500gms), Buttermilk (2000gms), Milk(600gms)		Dal(500gms), Rice(400gmg), Curd(500gms)		Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
6.	6[M(2), F(2)]	(2)				
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)	
7.	10[M(4), F(3)]	3				
	Cornchappati(1500gms), Buttermilk (2000gms), Milk(600gms)		Dal(500gms), Rice(400gmg), Curd(500gms)		Vegetable(3000gms), Roti(2000gms), Milk(500gms)	
8.	6[M(2), F(2)]	(2)				
	Cornchappati(1000gms), Buttermilk (1000gms),		Dal(250gms), Rice(350gmg),		Vegetable(2000gms), Roti(1000gms),	

	Milk(500gms)		Curd(500gms)		Milk(500gms)
9.	5[M(3), F(2)]				
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)
10.	7[M(3), F(2)]	(2)			
	Cornchappati(1000gms), Buttermilk (1000gms), Milk(500gms)		Dal(250gms), Rice(350gmg), Curd(500gms)		Vegetable(2000gms), Roti(1000gms), Milk(500gms)

5.2 Recommended Dietary Allowance (RDA) for different age groups per day requirement

5.2(a): RDA for CHILDREN

Age	Daily caloric need	Required Fat (per day)	Required Carbohydrates (per day)	Required Protein(per day)
2-3	1400	$1400 * 0.30 = 420$	$1400 * 0.55 = 770$	$1400 * 0.15 = 210$

5.2(b): RDA for FEMALES

Age	Daily caloric need	Required Fat (per day)	Required Carbohydrates (per day)	Required Protein(per day)
4-8	1200	$1200 * 0.30 = 360$	$1200 * 0.55 = 660$	$1200 * 0.15 = 180$
9-13	2200	$2200 * 0.30 = 660$	$2200 * 0.55 = 1210$	$2200 * 0.15 = 330$
14-18	2400	$2400 * 0.30 = 720$	$2400 * 0.55 = 1320$	$2400 * 0.15 = 360$
19-30	2400	$2400 * 0.30 = 720$	$2400 * 0.55 = 1320$	$2400 * 0.15 = 360$
30-50	2200	$2200 * 0.30 = 660$	$2200 * 0.55 = 1210$	$2200 * 0.15 = 330$
51+	2200	$2200 * 0.30 = 660$	$2200 * 0.55 = 1210$	$2200 * 0.15 = 330$

5.3(c): RDA for MALES

Age	Daily caloric need	Required Fat (per day)	Required Carbohydrates (per day)	Required Protein(per day)
4-8	2000	$2000 * 0.30 = 600$	$2000 * 0.55 = 1100$	$2000 * 0.15 = 300$
9-13	2600	$2600 * 0.30 = 780$	$2600 * 0.55 = 1430$	$2600 * 0.15 = 390$
14-18	3200	$3200 * 0.30 = 960$	$3200 * 0.55 = 1760$	$3200 * 0.15 = 480$
19-30	3000	$3000 * 0.30 = 900$	$3000 * 0.55 = 1650$	$3000 * 0.15 = 450$
30-50	3000	$3000 * 0.30 = 900$	$3000 * 0.55 = 1650$	$3000 * 0.15 = 450$
51+	2800	$2800 * 0.30 = 840$	$2800 * 0.55 = 1540$	$2800 * 0.15 = 420$

5.3: Total Phenolic Content, ABTS and DPPH result tables

Fig 1: Citrus lumia fruit



Table 5.3(a): Estimation results for Citrus lumia fruit

Concentration (ml)	Total Phenolic content (mg/ml)	Concentration (ml)	ABTS (%)	DPPH (%)
0.25	505	0.2	85.81%	85.65%
0.5	912	0.4	86.59%	86.60%
0.75	1252	0.6	88.05%	88.10%
1	1955	0.8	89.02%	89.10%
		1	89.59%	89.62%

Fig 2: Citrus pseudolemon fruit



Table 5.3(b): Estimation results for Citrus pseudolemon fruit

Concentration (ml)	Total Phenolic content (mg/ml)	Concentration (ml)	ABTS (%)	DPPH (%)
0.25	1111.2	0.2	82.38%	82.39%
0.5	2001.5	0.4	83.83%	83.85%
0.75	4002.5	0.6	85.59%	85.62%
1	5921.2	0.8	86.73%	86.80%
		1	88.02%	88.12%

Fig 3:Rhododendron arboreum squash



Table 5.3(c): Estimation results for Rhododendron arborum squash

Concentration (ml)	Total Phenolic content (mg/ml)	Concentration (ml)	ABTS (%)	DPPH (%)
0.25	1952.5	0.2	73.03%	73.13%
0.5	4921.2	0.4	78.12%	78.15%
0.75	8122.5	0.6	82.36%	82.37%
1	9125.2	0.8	83.83%	83.85%
		1	85.02%	85.12%

Fig 4: Buckwheat flour



Table 5.3(d): Estimation results for Buckwheat flour

Concentration (mg)	Total Phenolic content (mg/ml)	Concentration (ml)	ABTS (%)	DPPH (%)
0.25	1925.2	0.2	74.82%	74.85%
0.5	4251.2	0.4	75.38%	75.39%
0.75	8501.5	0.6	76.12%	76.15%
1	9101.2	0.8	77.39%	77.42%
		1	78.83%	78.90%

Fig 5:Rhododendron arboreum flower



Table 5.3(e): Estimation results for Rhododendron arboreum flower

Concentration (mg)	Total Phenolic content (mg/ml)	Concentration (ml)	ABTS (%)	DPPH (%)
0.25	1981.5	0.2	78.12%	78.20%
0.5	4602.5	0.4	79.25%	79.30%
0.75	8001.5	0.6	81.12%	81.15%
1	9753.5	0.8	83.25%	83.30%
		1	85.72%	85.75%

Fig 5(a): Dried Rhododendron arboreum flower



Fig 6:Ficus carica fruit



Table 5.3(f): Estimation results for Ficus carica fruit

Concentration (mg)	Total Phenolic content (mg/ml)	Concentration (ml)	ABTS (%)	DPPH (%)
0.25	512.5	0.2	72.12%	72.15%
0.5	2971.2	0.4	74.32%	74.35%
0.75	4001.5	0.6	76.55%	76.56%
1	6757.5	0.8	78.36%	78.38%
		1	79.75%	79.80%

Fig 6(a): Dried Ficus carica fruit



Fig 7:Amaranths seeds



Table 5.3(g): Estimation results for Amaranths seeds

Concentration (mg)	Total Phenolic content (mg/ml)	Concentration (ml)	ABTS (%)	DPPH (%)
0.25	927.5	0.2	66%	67%
0.5	1981.2	0.4	69.14%	69.20%
0.75	2961.2	0.6	72.42%	72.45%
1	3121.1	0.8	74.28%	74.30%
		1	78%	79%

Fig 8: Buckwheat seeds



Table 5.3(h): Estimation results for Buckwheat seeds

Concentration (mg)	Total Phenolic content (mg/ml)	Concentration (ml)	ABTS (%)	DPPH (%)
0.25	1935.4	0.2	65%	66%
0.5	4212.3	0.4	66.14%	66.20%
0.75	8511.7	0.6	72.35%	72.40%
1	9121.8	0.8	74.2%	74.15%
		1	76%	77%

6: Discussion

6.1: Inference concluded by the survey

While doing this survey in 10 different villages of district Hamirpur i came across the fact that there were no families who were consuming any kind of junk food or fast food. Families in village generally grew their own seasonal vegetables, wheat, rice, corn, mustard for oil and some of the legumes in their fields without using any pesticides and consumed the same throughout the year. And seasonally consumed the wild or traditional vegetables and fruits. After the survey when i calculated the recommended dietary allowance(RDA) for different families and for different age groups and sex it was found that none of the families were nutritionally deficient and they were consuming a balanced diet.

6.2: Total phenolic content

The antioxidant activity of phenolics is mainly due to their redox properties, which can play an important role in adsorbing and neutralizing free radicals, quenching singlet and triplet oxygen or decomposing peroxides. When the results were compared for estimation of total phenolic content for all the samples it was observed that Rhododendron arborum flowers had the highest phenolic content in them and Citrus lumia had the lowest phenolic content. The order in which the phenolic content was observed in the sample are Citrus lumia < Ficus carica < Amaranths seeds < Citrus pseudolemon < Buckwheat flour < Buckwheat seeds < Rhododendron arboreus squash < Rhododendron flowers.

6.3: DPPH free radical scavenging activity

The stable DPPH radical model is a widely used, relatively quick and precise method for the evaluation of free radical scavenging activity. DPPH is a stable free radical and accepts an electron or hydrogen radical to become a stable diamagnetic molecule. Antioxidant on interaction with DPPH both transfer electron or hydrogen atom to DPPH and thus neutralizing its free radical character and

convert it to 1,1-diphenyl-2-picryl hydrazine and the degree of discoloration indicates the scavenging activity of the drug. The reduction capacity of DPPH radical is determined by the decrease

in its absorbance at 734 nm induced by antioxidants. The decrease in absorbance of DPPH radical caused by antioxidants because of the reaction between antioxidant molecules and radical progress which results in the scavenging of the radical by hydrogen donation. It is visually noticeable as a change in color from purple to yellow. Hence DPPH is usually used as a substance to evaluate the antioxidant activity. The radical scavenging activity that was observed in the samples was that the highest scavenging activity was observed in Citrus limon and the lowest activity was observed in Amaranths seeds. The order in which the scavenging activity was observed in the sample are Amaranths seeds < Ficus carica < Rhododendron arboreus squash < Buckwheat flour < Buckwheat seeds < Rhododendron flowers < Citrus pseudolemon < Citrus lumia.

6.4: ABTS free radical scavenging activity

ABTS is converted to its radical cation by addition of potassium persulfate. This radical cation is blue in color and absorbs light at 734 nm. The ABTS radical cation is reactive towards most antioxidants including phenolics, thiols and ascorbic acid. During this reaction, the blue ABTS radical cation is converted back to its colorless neutral form. The radical scavenging activity that was observed in the samples was that the highest scavenging activity was observed in Citrus limon and the lowest activity was observed in Amaranths seeds. The order in which the scavenging activity was observed in the sample are Amaranths seeds < Ficus carica < Rhododendron arboreus squash < Buckwheat flour < Buckwheat seeds < Rhododendron flowers < Citrus pseudolemon < Citrus lumia.

7: Conclusion

A survey of food practices of natives of North western part of the outer area of Himachal Pradesh revealed a wide range of variability in ethnic foods made of cereals, pulses, milk, tubers. Some of the famous dishes include *Bhaturu, Babru, Beduan roti, Mithdoo, Seera, Madra, Sepubari, Kadi, Lasurae ki sabji, Bhruni ki sabji, Patrode*, etc. In addition to these conventional foods they use many types of uncultivated fruits and vegetables to supplement their diet. Simple indigenous methods are employed for processing and preparing these foods. The ethnic foods of the state not only exhibit a treasure of food heritage but it is an integral component of the state as some of the foods are specially prepared during marriages, local festivals and special occasions.

While doing this survey in 10, different villages of district Hamirpur we came across the fact that there were no families who were consuming any kind of junk food or fast food. Families in village generally grew their own seasonal vegetables, wheat, rice, corn, mustard for oil and some of the legumes in their fields without using any pesticides and consumed the same throughout the year. And seasonally consumed the wild or indigenous vegetables and fruits. After the survey when i calculated the recommended dietary allowance(RDA) for different families and for different age groups and sex it was found that none of the families were nutritionally deficient and they were consuming a balanced diet.

In the second part of the project the collection of samples from different districts was done so as to estimate the phenolic content and the antioxidant properties in the samples. Antioxidant compounds in food play an important role as a health protecting factor. Plant sourced food antioxidants like vitamin C, vitamin E, carotenes, phenolic acids, phytate and phytoestrogens have been recognized as having the potential to reduce disease risk.

As most of the samples are novel the comparative observations are difficult to report but according to the comparative observation among the samples shows that *Rhododendron arborum* flowers had the highest phenolic content in them and *Citrus lumia* had the lowest phenolic content and the highest scavenging activity was observed in *Citrus limon* and the lowest activity was observed in *Amaranth* seed.

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