ASSESMENT OF SOME SELECTED NUTRITIONAL QUALITY PARAMETERS OF LOCALLY DRIED TOMATOES

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CERTIFICATION

This is to certify that, this project (ASSESSMENT OF SOME SELECTED NUTRITIONAL QUALITY PARAMETERS OF LOCALLY DRIED TOMATOES) was conducted by DANLAMI ZHAMI, during 1988/1999 academic year in partial fulfilment of the requirement for the award of post graduate Diploma (P.G.D.) in Agric Engineering Federal University of Technology Minna.

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DEDICATION

This project report is dedicated to Almighty God for his infinite mercy on me. To my parents, Mr.Auta Yakloyi and Mr Zhami Kuche. To my wife and children for their love and understanding.

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First and foremost, all praises and gratitude be unto the Almighty God for all his infinite mercy on me.

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I wish to use this medium to express my profound gratitude to the Niger State Agricultural Development Project for the support and to Mrs. Comfort Danlami for her understanding despite all odds.

ABSTRACT

An assessment of some Nutritional Parameyters of Locally dried tomato fruits were carried out. This was with a view to generate some vital information on the Locally Processed tomato fruits. Quantification of such nutrients will help both farmers, processors and consumers on ways of improving on the processing methods. Some samples of both fresh and dried samples of tomato were obtained and moisture content, ash content, crude protein Lipid and Vitamin C content were determined using the A. O. A. C methods. The results showed that some of these quality parameters were highly concentrated in dried sample than in the fresh sample. For instance the values of protein Lipid and ash content increased tremendously in the dried sample as compere to the fresh samples vitamin C on the other hand reduces substantially in the dried product as compered to the fresh sample Recommended on ways of improving the method are given.

TABLE OF CONTENT

CHAPTER ONE

1.1 INTRODUCTION

Tomato Lycopersicon esculentum belongs to the family solanacea. It is an important fruit vegetable produced and consumed throughout Nigeria. The origin and history of tomato is not defined, but it is believed to have originated from peru or Mexico where it is cultivated in pre-columbian times.

Villareal (1980) reported that it was introduced into the European countries during the 16th Century. African tomatoes on the other hand were introduced by the Europeans. It is believed that tomato was introduced to Nigeria by the portuguese during the period of slave trade.

Tomato has now become an integral part of the diet for most Nigerians and an important source of income to a large number of farmers, middlemen and processors. The fruit is a highly perishable product in view of its high moisture content. Hence, there is usually glut during the production period and high price during the off – production period due to scarcity.

Field (1977) reported that tomato fruits are fleshy berries, hairy when young but smooth, juicy and shinny when ripe. The fruits is largely water, about 94%.

Tomatoes are known with yellow, orange, pink and green fruits beside the familiar red type. It is one of the important vegetables which has been cultivated for a very long time. It commands high economic value in the world. Tomato can be put into many uses in Nigeria. Such uses are, fresh paste, puree, salad and tomatojuice.

Villareal (1980) reported that tomato is highly nutritious as it is rich in protein, vitamins and the seed is known to contain 24% of edible oil. The fruit is a source of vitamins A, B and C.

In considering the processing of tomato, one should always remember that in general consumption of fresh tomato is preferable as preservation usually

destroys the sources of the nutritional value meaning that preserved fruits are not as good as fresh fruits. The extent of nutrient loss during processing varies greatly with each individual process. The drying process destroys fat soluble vitamins while the boiling process break down the vitamin and released into water solution.

UNIFEM (1989) reported that large amount of water content in fruit increases the spoilage activities of micro-organisms and insect especially under storage condition.

Deterioration and spoilage are caused by two primary agents – Internal agents and External agents. The internal agents are enzymes while the external agents are microbes. This knowledge is vital for effective preservation of the fruit. Therefore, since fruits are seasonal and perishable, processing is still one of the important methods used in dealing with over production.

1.1 STATEMENT OF THE PROBLEM

Preservation of Agricultural produce has always been a major problem to man. The distribution of man over wide climatic areas and the increasing urban population makes this problem an interesting one that need urgent attention.

Olurunda and Aboba (1978) revealed that between 30% and 50% of this produce are lost during the post harvest period as a result of poor handling and inadequate storage facilities.

Ajiboyo (1986) stated that since Agricultural products are sources of raw materials and needed to be preserved until when needed for consumption or use in industry, it is desirable to improve on the processes of preservation.

The losses being incured sometimes discourage producers hence resulting in low production and subsquent increase in price. With this losses there is thus need for farmers to try and the cheapest method available to them is the open sundrying.

Sundrying and processing of tomato is mostly carried out in northern Nigeria. Fruits are sliced into tiny pieces and spread evenly to ambient

temperatures. Experiences have shown that Products from such drying possesses unfavourable taste, colour and dirts.

However, data on the quantity or extent of such damage done to the product by this processing method are hardly available. It is important, to quantify such losses since no proper solution or planning can be done without adequate data.

1.3 JUSTIFICATION OF STUDY

Gomez (1981) reported that National surveys in some parts of Africa have identified a number of micro nutrient deficiency problem especially in vitamin A, folic acid, calcium and iron.

The study also showed that malnutrition has been due to poverty and ignorance in developing countries as such fruits and vegetable remains the cheapest and commonest sources of micro-nutrient.

Nutrient data on green leafy vegetables indicated that they are good sources of B-carotene, vitamin C, Folic acid, calcium and iron.

The Table below showed some common vegetables and their vitamin C content.

Table 1: NUTRIENT CONTENT OF SOME VEGETABLE VITAMIN C. (mg/100g Fresh Weight

COMMODITY	RANGE	MEAN
Cabbage	21.6 – 46.3	26.9
Cassava leaf	148.0 – 460.8	310.8
Spinach	116.3 – 273.0	169.0
Lettuce	2.0 – 10.4	8.6
Pumkin Leaf	28.8 – 43.1	30.6

Kordylas (1990)

The availability of Fruits and vegetables are seasonal. They are particularly scarce during long period of drought. Drying or dehydration would not only ensure a year round availability of Food but would reduce wastage of these highly perishable Fruits and vegetables during the season of excess.

Fruits and vegetables are heat sensitive and nutrient loss such as colour and flavour changed do occur during drying.

Kordylas (1990) reported that in order to improve the quality nutrient in valuable vegetable processing technologies should be practiced properly to ensure nutrient retention. The use of sundrying by our local Farmers to dry vegetable do not have any scientific control and this do lead to loss of the needed nutrients in drying processes.

The conservation of micro nutrient quality is an important consideration in relation to prevalent micro-nutrient deficiency problem. It is therefore necessary to quantify the extent of the loss or otherwise incurred in these nutrients in the locally dried tomatoes. Quantification of such loss will enable processors and others involved to adopt new technologies or improve on the existing methods.

1.4 OBJECTIVES OF THE STUDY

The objective of the study include the following. To determine some of the nutritional values of locally dried tomatoes and compared them to the Fresh sample values.

To recommend ways of improving these drying techniques being used by the local farmers, all with a view to ensure that consumers get produce of good quality.

CHAPTER TWO

2.0 LITERATURE REVIEW

Andrew (1992) reported that tomato fruits are perishable and that the fruits are always surplus during the peak production. The studies observed that there is need for methods of storage and preservation to be improved on for maximum utilization.

Collway and Howes (1987) reported that tomato can be processed by drying in order to free the produce from moulding. High moisture content it is revealed helps in development of mould and this later aid fungus and thus make tomatoes fruits useless if not dried well. Tomatoes it is noted can be kept up to 2 years if properly dried and packed.

Mijimdadi and Abidugun (1993) revealed that tomato is mostly used in Nigeria at the family level for stew, paste and purree.

Since the demand is all year round, while its production is seasonal, there is need for proper processing methods to be developed so as to ensure good storage.

Kordylas (1984) noted that there are several methods by which fruits and vegetables can be processed so that they can be stored for longer period and hence make them available during the off season period. The methods used include dehydration and canning.

Kordylas (1990) however that fruit with high sugar content are difficult to dry as the usually becomes Leathery and Chewy after drying. The studies indicated that emperature range of 35°c – 63 are ideal for drying fruits and vegetables as most enzymes are destroyed at higher temperatures above 60°c.

UNIFEM (1990) reported that fruits and vegetables should be washed and sliced to hasten drying. Vegetable it is noted must be blanched at 88°c to deactivate enzymes causing excessive vitamin loss. However most fruits do not need bleaching but chemical dips are applied on some.

Rice (1986) reported that the main objective of preservation of perishable crops is to make them retain their quality and fresh condition.

Exposure to sun, rain or wind it is noted and should be avoided and were ever possible the produce should be kept in humid condition at low temperatures. It is noted will keep many leafy vegetables in good condition for several days, but this rarely practicable in most areas. However, the provision of a well-ventilated but shaded structure in which the harvested crops can be placed so that they are not unduly exposed to the heat of the sum and regular sprinkling with water would assist in maintaining freshness and quality for some time.

UNIFEM (1988) reported that through its job creation program has been operating a project on solar food drying as part of its agricultural program. The main objective of this project has been the a doptation and development of simple techniques for solar drying of fruits and vegetables. The concept of drying is not new since fruits and vegetable were traditionally sun-dried. Improving the sun drying method seems appropriate because it is both simple and cheap as a method of preservation. A solar cabinet dryer was adopted fro use in Bangladesh and tested on coconut Wilbur (1974).

Hamly and Pfaff (1975) revealed that Tomatoes suffered the greatest loss during transportation from the farm to the Urban centre. This is due to it high initial moisture content and low P.H range at normal atmospheric temperature which makes them most susceptible to against of spoilage and deterioration.

Therefore the major option left to peasant farmers, is open drying which is cheaper. However since these drying techniques lack modern controls it is difficult to ascertain the extent of nutrient loss in the process. Quantification of such loss or otherwise is necessary so as to effectively control them through introduction of some modification to the drying system being used by the local farmers.

Kramer and Twigg (1966) though reported that nutritive value is not usually considered in the market place however some mandatory regulation are applied for some products which is shown in the table bellow.

Table 2: Nutrive value of selected Raw and Canned Commodities all values are 100g bone dry materials.

Kramer and Twigg (1966).

Food	calories	(g)Water	(g) protein	Carbohydrate	Mineral Calcium	Iron
Cablage						
Raw	278	1,011	3	42	803	14
Dried	208	5	2	33	532	5
Carrot						
Row	211	1,011	8	48	410	4
Dried	243	5	8	48	352	4
Potato						
Raw	263	317	9	87	30	3
Dried	275	5	7	67	29	2
Tomatoes						
Raw	233	1,567	16	47	222	7
Dried	152	5	13	25	156	5

Arnold (1978) reported that heat being the main cause of damage, the drying process Usually has little effect on protein quality unless the temperature of the food is allowed to rise above 100°c. it is also said that so long as there is free escape steam, the temperature of the heated food can not rise above 100°c while moisture is present, however rapid is the heat input. Also during drying mineral particularly vitamin is lost. Vitamins are degraded by light, heat, oxygen, or oxidizing substances including P.H, enzymes and metals Lee (1983). Ascorbic

acid vitamins are unstable in neutral or alkaline conditions and also light, heat and air conditions. Hence the need to quantify the amount of these vital nutrients that are lost during drying.

Ajayi and Osifo (1971) reported that drying of fruits and vegetable helps to concentrate the protein and at the same time destroys the ascorbic acid and the vitamin A content. A lot of factors are associated with drying, namely,

Climatic factor

Relative humidity

Moisture content in fruits and vegetable

Drying temperature.

Time of drying.

The negligence of these factors may cause a situation known as case hardening which is due to more rapid evaporation of moisture from the surface than the diffusion from the interior thus causing a hard, horny impenetrable surface film that impedes further drying.

Anon (1981) reveal that applying heat to fruits and vegetable crops in order dry it does not merely remove the moisture but do also affects the overall quality of the dried product. Such effects include among others:-

Browning: decolouration material during drying can be caused by either physical processes or by chemical reactions.

(i) physical decolouration evidenced as charring or scorching can be generally attributed to thermal breakdown of complex molecules into simpler chemical structures.

(ii) Decolourisation by chemical reaction can be further categorized as either enzymic or non-enzymic reaction. Enzmic reactions are those brought about by the action of naturally occurring enzymes in the drying material, which are released as the plant tissue breaks down. Example is the browning of fruit slices such as apples and bananas when freshly cut there by exposing the fruit to the atmosphere.

(iii) The rate of most browning reaction is greatly dependent upon the combine effect of time and temperature and on the moisture content of the drying material. Hence the rate of drying increase with increase intemperate and therefore an optimum has to be reached between the highest drying rate and acceptable degree of browning. It is in view of this problems that are associated with the quality of dry products that necessitated this project work. It is necessary to actually ascertain the quantity of these quality attributes of the locally dried tomatoes that are retained after the process.

CHAPTER THREE

3.0 MATERIALS AND METHOD

3.1 MATERIALS

SAMPLES

The samples used fresh tomato and local dried tomato.

SOURCE OF SAMPLE

The fresh tomatoes and locally dried tomatoes were picked directly from the vegetable garden in chanchaga i.e from Mallam Musa Abubakar's farm.

APPARATUS

The apparatus used for the assessment include the following. Knife for slicing fruit, bowl for pre-treatment of fruit, chemical e.g sodiummetabi sulphate for treatment, sensitive weighing balance, crucible with tightly fitting lids, dissector, mortar an pestle, air ovendry, muffle furnace, micro-kjeldahl flask. Conical flask, burettes and pipette of various sizes.

LABORATORY CHEMICAL AND REAGENTS

Starch Solution

0.5g of soluble starch was mixed in 30ml of water. This mixture was added to 100ml of boiling water and was allowed to boil for 3 minutes and then cooled.

PHENOLOPHTHALIN

This was prepared by weigh exactly 10g of powdered phenolphthalin and mixed thorughly in 1 litre 95% v/v ethanol.

DAM'S REAGENT

Dam's reagent was prepared by dissolving 8.25m of pyridine of 6ml of concentrated H_2 SO_4 in cooled 20ml glacial acetic acid. To this solution was added a solution of 2.6ml bromine in 20ml glacial acetic acid. The mixture as diluted to 1 litre with glacial acetic and kept in reagent bottle for anaglysis.

METHODS

SAMPLE PREPARATION

Tomato fruit was sliced into small particles in order facilitate easy assessment work. The crushing was done using mortar and pestle to produce fine particles which was then used for various determination.

DETERMINATION OF PERCENTAGE MOISTURE CONTENT

The method adopted was that of air oven as outlined by the food and Agricultural organization (F.A.O 1981). Three clean crucible with tight fitting Lids were dried to constant weight and weighed (w_1) 0.5g sample was weighed into each of the three crucible with lids and their contents were weighed (w_2). The were then put into the oven and dried at 90°c for 8 hours after which the were allowed to cool in the desiccator and were then weighed. The drying and weighing process 3were repeated after 1 hour until a constant weigh was obtained calculation for % m.c $\frac{w2-w3 \times 100}{W2 - w1}$

DETERMINATION OF ASH CONTENT

The method used was base on that outlined by University of Leeds (1975) or TDRI (1984). The crucible and the Lids were dried in the oven at 105°c for about 6 hours. Cooled in the dessicator and weighed. The drying was continued until constant weight were attained (w_1) 0.5g of sample was then put into each

crucible and reweighed (w_2). The sample in the crucible were then heated on the bunsen flame in a fume chamber until smoking ceased. They were then transferred into the muffle furnace and heated at 550°c for about 18 hours, at the end of which the ashes were white. The crucible were then cooled in the desicator and reveighed (w_3)

Calculation for Ash content

$$\% \text{ Ash } \frac{w3 - w1}{w2 - w1} \times 100$$

DETERMINATION OF PROTEINT CONTENT

The method used was TDRI 91984) determined by the micro-kjeldahl method 100-200g of material was weighed into clean dry 50 or 100 kjeldahl flask; 3ml or 6ml of concentrated sulphuric acid was added to the sample follow by some glass beeds.

It was then carefully digested over electric heater (carefully digested over electric heater (digesting block) in the hood (Fume Chamber) initially with low flame till the frothing subsided and then at higher temperature it becomes clear with palestraw color. Heating was then continued for more than 60 minutes. The heater was put off and the flasks were allowed to cool and 15ml of distilled water was added to each of the flasks. The contents were transferred quantitstively to 50ml volumetric flask. The kjeldahl flask were rinsed of using distilled water but the glass were left in the digestion flask. The contents sample was then made up to marked volume with distilled wated and mixed thoroughly. 10ml of the digest was the pipepetted into markham distiller and 40% sodium hydroxide solution was added to the digest. The steam distilled ammonia Liberated was collected into 5ml boric acid solution containing 4drops of mixed indicator (Bromo-cresol green methyl/red and thymol blue in the conical flask)

After the indicator turned green the distillation was continued for the next 2 minutes. The distillate was removed and fitrated with standard, hydrochloric acid and end point been reached when the indicator changed from green through grey to definite pink. The amount of acid used (Litre was recorded v1 m1). A blank containing 6ml concentrated sulphiric acid H2SO4, one tablet of kjeldahl catalyst without any sample was prepared and the above procedure was carried out on it. The burrettee reading was recorded V_2ml)

Calculation

The percentage (%) Nitrogen content is given by the formular %.

$$\% \text{ Nitrogen } \frac{(N2) = (V1-V2) \times 0.1 \times 11.4}{m}$$

$$N2 = \frac{(V1-V2 \times 5 \times 14 \times 100}{100 \times 70 \text{ sample wt (g)}} = \frac{\text{Corrected litre ml}}{10 \times \text{wt of sample}}$$

The protein was calculated by multiplying % N2 by a factor 6.25.

DETERMINATION OF VITAMINS

The method used was from University of Leed (1975). Hydrochloric acid 2% aqueous solution and 2.6 dichloro-phenolindophenol, 0.001m aqueous solution were used. The sample was weighed transferred to motor with a scalpel and then filtered with 5ml of hydrochloric acid. A small piece of cotton wool was put in funnel and the tiltrate mixture was filtered into a graduated flask. The extraction of vitamin C was repeated from the same sample. Three using 5ml of hydrochloric acid. For each extraction and filtering the extracted portion was put into a graduated flask to mark with distilled water and mixed 10ml of extracted solution was poured into a filtration beaker and titrated with 2-6 dichlorophenolindophenol solution from a micro burette until the last discharge of a pink colouration persist for 30 second.

$$\frac{X \times 0.88v \times 10 \times 1000}{10b}$$

Where x = as cubic acid concentration mg/kg 0.88 = mass of as cubic acid titrimetrically equivalent to 0.001ml.

2 –6 dichlorophenolindophenol solution 1000 = scaling factor for conversion per kg of raw materials

10 = is the tritrated volume m1

V = the titrated volume

B = sample weigh

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 RESULTS

The results of the assessment of selected nutritional quality parameters of locally dried tomatoes, are presented in tables 4.1 while the details of how they were obtained are given in appendix A.

Table 4.1 Summary of the result of parameters of locally dried tomatoes and the fresh sample.

Parameters	Fresh Sample Mean values	Locally dried samples Mean values
Moisture (%w.b)	96.67	5.00
Ash Content (%)	0.97	4.87
Crude protein (%)	1.03	5.83
Lipid Content (%)	2.45	6.23
Vitamin C (mg/100)	8.2	2.06

DISCUSSION

The results of the assessment of some nutritional parameters of locally dried tomatoes as influenced by drying are a shown in table 4.1.

MOISTURE CONTENT

The results of the values of moisture content of the fresh tomatoes and dried tomatoes showed that the mean moisture content of the fresh tomatoes was determined to be 96.67%(w.b) and this value fall in the range values give in Literature F. A. O (1968) F.A.O (1972). On the other hand the mean moisture content of the locally dried samples was to be 5% (w.b). the result indicated that the locally dried sample are dried to uncontrol home dry. This value thought can

preserved the product for a long period but still absolute removed of moisture could affect other nutrients. It was observed that dying method does not involve any scientific control as the farmers dry until he feels the produce is dried enough.

ASH CONTENT

Ash content (Table 4.1) showed that the fresh tomatoes was found to have a mean ash content of 0.97% while that of the dried samples was 4.81%. The result showed that the dehydrated tomatoes fruits are much more concentrated in dry matter than the fresh samples. This high concentration of dry matter in dried tomato fruits is one factor that consumers especially those involve in restaurant burnness used in preferring dried product to fresh sample because the require less quantity of the dried sample to fresh as in preparing the quantity of soup.

CRUDE PROTEIN CONTENT

The result (Table 4.1) showed that the quantity of crude protein in fresh tomatoes was determined to be 1.03% while the mean value for dried sample was 5.83%. the result showed a high concentration of crude protein in the dried sample. It has been shown that the protein content of tomatoes fruits is concentrated in the seeds, hence the dry sample with high dry matter per unit area is thus high in protein content than the fresh sample.

LIPID CONTENT

The results (Table 4.1) showed that the mean value of the Lipid Content of the fresh samples was 2.45% while that of the locally dried sample was 6.23%. Again the result showed a higher concentration of Lipid in the dried samples than the fresh produce the result is in conformity with other similar research work as noted from literature (Salunkhe et al (1974). This may also be due to some element of micro-activities during the drying process although some literatures said that Lipid are not stable when heat is applied (Nury et al 1968).

VITAMIN C CONTENT

Table 4.1 showed that the mean value of vitamin C content of the fresh tomatoes has 8.2 m/100g of the sample while that of the dried sample was 2.06mg/100 of sample F.A.O (1962) however gave values of vitamin C as 10.85mg/100g. the variation may be due to parcetal difference. The result showed there is remarkable difference in the vitamin C content in that of the fresh sample than that of the dried sample. The low level of vitamin C content in dried tomato fruits showed that part of the vitamin C content must have been destroyed during the drying process. Studies have shown that losses of vitamin content is inevitable during drying, (Salunkhe et al 1974) such studies also showed that substantives of such vitamins could be refeassed by subjecting the sample to other treatment such as blanching.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

The aim of this study was to analyse some of the nutritional parameters of locally dried tomatoes as there are affected during drying process. With a view to quantifying these values. Such quantification will provide information to both processors and consumers which could be used to improve their Techniques of drying and processing. While some of the nutritional content of the dried tomatoes such as ash content, crude protein and Lipid content showed an increase in values compared to the fresh values other values such as vitamin C content decreased substantially in the dried sample. It can be concluded that drying as a measure of preservation helped in controlling some of these nutrients. The locally means of drying being very cheap can be encouraged but there is need to improve on its techniques. One major set back noticed during this was that of the colour of the dried product is not applied, since appearance is on of the major criteria used in accepting such product, an improvement is required in that area.

RECOMMENDATIONS

1. Provision of solar panels instead of open sundrying system can help one to control some of the drying factors.
2. Sulphiting in order to improve the colour during drying should incorporated since this help to retain the colour of fruits and vegetable during drying from browning.
3. Blanching of fruit and vegetable prior to drying can as well help to retain such nutrient like vitamin C.
4. Pr-drying operation such as slicing is also recommended since this can reduce the drying time and hence save the processors of Labour of packing and respreading everyday.

APPENDIX A

Table 4.2 Moisture Content for fresh and dry tomatoes.

Fresh Samples				Dry Sample			
Wt of Crucible (w_1)g	Wt of Crucible + sample (w2)g	Wt of Crucible + Sample after drying (wg)g	% M.C	Wt of Crucible (w1)g	Wt of Crucible +Sample (w2)g	Wt of Crucible + Sample after drying (w3)g	% M.C
22.140	27.140	22.340	96%	21.367	26.367	26.116	5.02
20.790	25.790	20.890	98%	22.142	27.142	26.892	5.00
22.140	27.140	22.340	96%	22.142	27.141	26.892	5.00

Value for fresh sample

Formular $\frac{w2-w3}{w2-w1} \times 100$

Mean = 96.66%

Value for dried sample

Formular $\frac{w2 - w3}{w2-w1} \times 100$

Mean = 5%

Table 4.3 Ash Content.

Fresh Samples				Dry Sample			
Wt of Crucible (w_1)g	Wt of Crucible + sample before ashing(w2)g	Wt of Crucible + Sample after drying (wg)g	% Assh	Wt of Crucible (w1)g	Wt of Crucible +Sample before Asing (w2)g	Wt of Crucible + Sample after ashing (w3)g	% Ash
13152	18.152	13.200	96%	18.652	23.652	18.92	4.8
22.646	27.646	22.695	98%	22.761	27.761	23.011	5.0
22.647	27.647	22.696	96%	18.652	23.652	18.893	4.82

Value for fresh sample

Formular $\frac{w3-w1}{w2-w1} \times 100$

Mean = 0.97%

Value for dried sample

formular $\frac{w3-w1}{w2-w1} \times 100$

Mean = 4.87%

Table 4.4 Crude Protein.

Fresh Samples					Dry Sample				
Initial reading of burette(cm)	Final burette reading (cm3)	Titre volume $(cm)^3$	Wt sample (g)	%	Initial burette reading (cm)	Final burette reading $(cm)^3$	Titre volume $(cm)^3$	Wt of Sample (g)	% Protein
0.00	0.5	0.5	0.25	1.00	1.06	3.20	2.20	0.25	5.50
0.50	1.02	0.52	0.25	1.05	2.20	4.60	2.40	0.25	6.00
0.50	1.02	0.52	0.25	1.05	2.20	4.60	2.40	0.25	6.00

Value for fresh

Formular $\frac{v1-v2x5x14x100}{1000x70+\text{sample wt(g)}}$

% Protein = %Nx6.25 (constant)

Mean = 1.03%

Value for dried sample

$\frac{\text{corrected tire value}}{10 \text{ x wt of sample}}$

Mean = 5.83%

Table 4.5 Lipid Content.

Fresh Samples				Dry Sample			
Wt of Crucible $(w_1)g$	Wt of Crucible + sample before ashing(w2)g	Wt of Crucible + Sample after drying (wg)g	% Assh	Wt of Crucible (w1)g	Wt of Crucible +Sample before Asing (w2)g	Wt of Crucible + Sample after ashing (w3)g	% Ash
2.720	7.720	7.597	2.46	2.453	7.453	7.125	6.56
2.698	7.698	7.576	2.44	2.336	7.336	7.007	6.58
2.698	7.698	7.516	2.44	2.453	7.456	7.125	6.56

Value for fresh sample

% Lipid = $\frac{w2 - w3}{w2 - w1}$ x 100

Mean = 2.44%

Value for dried sample

% Lipid = $\frac{w2 - w3}{w2 - w1}$ x 100

Mean = 6.56%

Table 4.6 Vitamin Determination.

Fresh Samples					
1st titre value (cm3)	2nd titre Value (cm2)	Vitc content mg/100	1st tirtre value cm3	2nd tire value (cm3)	Vit C content mg/100
0.71	0.70	8.2	0.40	0.40	2.06
St 5.2	5.1	-	5.2	5.2	-
Blank 0.3	0.3	-	0.3	0.3	-

T= wight of sample dilution factor

St = standard for vit C = 100

B = Blank

Value for fresh sample

Formula $\frac{T - B \times \text{Dilution factor}}{St - B}$

Value for dried sample

Fomula $\frac{T - B \times \text{Dilution factor}}{St - B}$

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