PHYSIOCHEMICAL AND MICROBIOLOGICAL EVALUATION OF STORED SWEET POTATO TUBERS (*Ipomoea batatas* (L) Lam.)

BY

OKOYOMON EHIMHEN EUGENE

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A PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF PLANT BIOLOGY AND BIOTECHNOLOGY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE (HONOURS) IN PLANT BIOLOGY AND BIOTECHNOLOGY IN THE UNIVERSITY OF BENIN, BENIN CITY, EDO STATE, NIGERIA.

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CERTIFICATION

We hereby certify that this project work was carried out by **OKOYOMON EHIMHEN EUGENE** with matriculation number LSC1807134 of the Department of Plant Biology and Biotechnology, Faculty of Life Science, University of Benin, Benin City, Nigeria.

Dr. Mrs. A. O Chime	________________
Project Supervisor	Signature and Date
Dr. J. Erhabor	________________
Project Supervisor	Signature and Date
Prof. D.E. Vwioko	________________
Head of Department	Signature and Date
External Supervisor	________________
	Signature and Date

DEDICATION

This work is dedicated to Almighty God for His care and love and guidance, as well as to my parents, Mr. Barry Okoyomon and Mrs. Esther Okoyomon, for their unwavering love and support. I would also like to express my gratitude to my brother, Mr. Bobby Okoyomon, for his continuous love and support.

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ABSTRACT

The objective of this study is to determine the physiochemical composition and microbiological analysis to determine the storability of Sweet potato tubers, sold at New Benin Market, Edo state. Two cream skinned sweet potato tubers were obtained at New Benin Market, Edo state and stored in a laboratory for a period of time . In the laboratory, physiochemical tests were conducted on the potato samples to determine the moisture content, dry matter content, acidity, titratable acidity, and vitamin content. Microbiological evaluation of the sweet potato tubers was conducted in the laboratory, using laboratory techniques of isolating fungi, this involves the preparation of PDA, the physiochemical and microbiological assessment was carried out on one of the potato tubers the day it was obtained and the results was used as control for the experiment ,after 40 days the same physiological and microbiological tests were conducted on the stored sweet potato tuber in the laboratory. There was a slight decline in the physiochemical composition of the sweet potato tuber after 40 days of storage. The microbiological test confirmed the presence of spoilage inducing fungi on the sweet potato tuber after 40 days of storage, the occurrence of these fungi confirmed that the potato tuber stored has undergone spoilage. Through this research it was determined that sweet potato tubers exhibit a good storage capacity, as evidenced by the minimal variance in their physiochemical composition even after a 40-day storage period.

CHAPTER ONE

INTRODUCTION

1.1 Sweet potato (*Ipomoea Batatas* (L) Lam.), is a root crop which supports millions of people throughout the tropical regions of the world. The edible tuberous root is either long and tapered, ovoid or round with various types of skin color, from white, brown, purple or red. The flesh color from white, pale cream, orange or purple. The plant is valued for its starchy flesh or pulp found inside. This is the part of the sweet potato that is commonly consumed and prized for its nutritional value and taste. The flesh of sweet potatoes is rich in complex carbohydrates, dietary fiber, vitamins (such as vitamin A, C, and B vitamins), and minerals (such as potassium and manganese) , sweet potatoes are considered as one of the most important food crops of man due to the health contributing principles in the tubers and leaves. Sweet potato also utilizes a major part of its production for animal feed purposes. sweet potato roots can also be a part of the food-based strategy to compensate for vitamin A deficiency, because of its good source of vitamin A. In African countries, the plant has significant medicinal importance and various parts of the plant are used in traditional medicine.

1.2 ORIGIN AND DISTRIBUTION OF SWEET POTATO (*Ipomoea Batatas* (L) Lam.)

Based on analysis of morphological characters of sweet potato and the wild Ipomoea species, the centre of origin of I. *batatas* was thought to be somewhere between the Yucatan Peninsula of Mexico and the mouth of the Orinoco River in Venezuela (Austin, 1998). Other work, based on morphological variation in I. *batatas*, indicated maximum diversity in the area comprising Colombia, Ecuador and northern Peru (Yen, 1982). Recently, the highest diversity in Central America revealed by the use of molecular markers provides evidence that Central America is the primary centre of diversity and most likely the origin. The best known and early documentation of sweet potato was the post-Columbian spread by Europeans, this resulted in the introduction of West Indian sweet potatoes to Europe, from there they were further introduced into Africa, Brazil and India in the 16th century by Portuguese explorers, Today sweet potato, with more than 133 million tons in annual production, ranks as the fifth most important food crop in developing countries after rice, wheat, maize and cassava(International potato center, 1998).The International Potato Center (CIP) has carried out numerous sweet potato-collecting expeditions in Latin America and the Caribbean since 1985 (Huamán and Zhang, 1997),Donations from other countries and the transfer on sweet potato collections previously maintained in other international research centers further expanded the collection. The sweet potato gene bank maintained at CIP now contains 5526 cultivated accessions from 57 countries; 2589 of them from Latin America. Peru alone contributed 1099 accessions (Huamán and Zhang, 1997). Sweet Potato produces more biomass and nutrients per hectare than any other food crop in the world and it is well suited to survive in fertile tropical soils to produce tubers without fertilizers and irrigation, it is one of the crops with an important role to solve world hunger.

1.3 TAXONOMY OF SWEET POTATO(*Ipomoea Batatas* (L) Lam.)

Sweet potat*Ipomoea batatas*) o (is a dicotyledonous and perennial plant, belonging to the Convolvulacee family, recognized mainly for generating tuberous roots that are used all over the world, for the most diverse purposes. It is a dicotyledonous angiosperm because, during the germination period and the beginning of its growth, the sweet potato presents the formation of two cotvledons which assist in the generation and storage of the energy necessary for the development of the plant (Huaman, 1992). The taxonomy of sweet potato originate from the angiosperm class and dismembers together with the Eudicot, Superasterids and Asterids, which in turn branches the class lamiids which group the other solanales that hold the family Convolvulaceae. (angiosperm phylogeny group, 2009).

Table 1: Scientific classification of *ipomoea batatas*

Kingdom:	Plantae
Clade:	Tracheophytes
Clade:	Angiosperm
Clade:	Eudicots
Clade:	Astrids
Order:	Solanales
Family:	Convolvulaceae
Genus:	*Ipomoea*
Species:	*batatas*

1.4 BOTANY OF SWEET POTATO (*Ipomoea batatas* (L) Lam.)

The sweet potato is a perennial vine with trailing or climbing stems that can extend several meters in length. During the growth of the plant, the stem develops in a crawling way, prostrate to the ground, manifesting repetitive sprouting, being able to generate roots in the points where the internodes present contact with the soil. The stem is tender and flexible , consisting of the epidermis, the cortex, and the vascular system (Edmond and Ammerman, 1971)). It has a cylindrical shape and is slightly flattened with a predominance of green color, and may also have a purple, violet or purple depending on the type of cultivar (Huaman, 1991). The leaves are simple, glabrous, or slightly pubescent, with an aspect that varies between ovate, orbicular, sagittal, cordiform or elliptical, and grows petiolate with the entire edges, with the corded base being its main characteristic. The growth of the leaves along the stem presents a spiral configuration of a pentamer pattern or phyllotaxis 2/5, that is, the genetic spiral completes two turns that group five leaves, with the sixth leaf developing relatively above the first leaf (Jean, 2009). The plant has a well-developed root system, consisting of a main root , secondary root and tertiary root system reaching up to 90cm in dept .The development of the roots follows the characteristics of dicotyledonous plants, with the formation of an axial root (storage root) qualified as a tuberous root that is an elongated, round or fusiform shape, highlighted by the high thickness, and the absorbent roots (pencil and fibrous roots), which are abundant and branched and work on the extraction and transportation of water and nutrients from the soil to the plant.(Lopes *et al.,* 2008)

1.5 NUTRITIONAL COMPOSITION OF SWEET POTATO TUBERS (*Ipomoea Batatas* (L) Lam.)

Sweet potato tubers contain essential nutrients such as carbohydrates, fiber, carotenes, thiamine, riboflavin, niacin, potassium, zinc, calcium, iron, vitamins A and C, and high-quality protein. They are particularly valuable as a source of dietary energy due to their carbohydrate content. They're rich in deity fiber and have high water content, in addition sweet potato tubers are also high in minerals such as potassium, phosphorus, calcium and iron (USDA, 2009).

1.6 CHEMICAL COMPOSITION OF SWEET POTATO (*Ipomoea Batatas* (L) Lam.)

Sweet potato roots contain ample amounts of starch, sugar, vitamin C, beta-carotene, iron, and various minerals (Laurie *et al.,* 2012). Despite its significant carbohydrate content, sweet potato has a low glycemic index because the starch it contains is not easily digested. This makes sweet potato a suitable food choice for individuals with diabetes or those who are overweight (Etong *et al.*, 2014). In addition, the presence of colored pigments, such as b-carotene, anthocyanin, and phenolic compounds, in certain types of sweet potatoes is what distinguishes them as nutraceuticals (Oloo *et al.,* 2014), orange fleshed sweet potatoes are rich in vitamin A which can help to combat and prevent vitamin A deficiency.

1.7 PEST AND DISEASES AFFECTING SWEET POTATO (*Ipomoea Batatas* (L) Lam.)

Over 30 viruses have been documented as infecting sweet potatoes in total,(Brunt *et al.,* 1996; Clark *et al.,* 2012), the number continues to increase as virus detection methods are improved. Only a few of the viruses are considered to be of major economic importance. These include the Sweet potato feathery mottle virus (SPFMV), Sweet potato chlorotic stunt virus (SPCSV), Sweet potato virus G (SPVG), Sweet potato mild mottle virus (SPMMV), Sweet potato chlorotic fleck virus (SPCFV), Sweet potato latent virus (SPLV), Sweet potato caulimo-like virus (SPCaLV), Cucumber mosaic virus (CMV) and Sweet potato leaf curl virus (SPLCV). Viruses often occur in multiple infections in the field with the most commonly encountered combination being that between SPFMV and SPCSV. This dual infection is responsible for the severe sweet potato virus disease (SPVD) which has been reported to be the major viral disease in East Africa (Chavi *et al*., 1997; Mukasa *et al*., 2003). Viruses' infections have considerable effects on cell metabolism such as photosynthesis, respiration, and transpiration. The effects include increasing the activity of some enzymes, decreasing the activity of others, and not affecting the activity of yet others. Symptom induction is primarily, by the perturbation of the cell metabolism and damage to cell organelles such as chloroplasts (Roger H, 2009).In East Africa, severe sweet potato virus disease (SPVD), characterized by small, distorted leaves which are often narrow (strap-like) and wrinkled, with a chlorotic mosaic or vein clearing, stunting of plants and heavy yield losses, has been reported in Uganda since 1944 (Karyeija *et al*., 1998 and Mukasa *et al.,* 2003) and later in Kenya, Tanzania, Rwanda, Burundi, and Malawi. Sweet potato virus disease (SPVD) is the most devastating diseases of sweet potato and caused by dual infection with the whitefly-transmitted sweet potato chlorotic stunt virus (SPCSV) and the aphid-transmitted sweet potato feathery mottle virus (SPFMV). Another severe disease is Chlorotic Dwarf (CD) caused by SPFMV, SPCSV and sweet potato mild speckling virus (SPMSV) which occur in numerous countries throughout the world (Tairo, 2006), sweet potatoes are also affected by diseases caused by pathogens, (sweet potato scab), fungi, Rhizotonia sp. and Lasidiopodia sp. (root and stem rot disease), nematodes (root knot nematodes) and bacteria (bacterial wilt , black rot and bacteria soft rot).

Pests that feed on sweet potatoes are, sweet potato butterfly, the caterpillars feed on the leaves, the older larvae eat the whole leaf lamina except the primary midribs and sweet potato weevils, they attack the vines and tubers which cause serious damages to the plant.

1.8 ECONOMIC IMPORTANCE OF SWEET POTATO (*Ipomoea Batatas* (L) Lam.)

In Nigeria consumption of sweet potatoes has increased slightly in recent years. The increased consumption is largely due to national advertising campaigns focused on the nutritional aspects of sweet potatoes aimed at health conscious consumers. Sweet potato is very high in nutritive value. Sweet Potatoes rank as one of the healthiest vegetables, because of high levels of vitamins A and C, iron, potassium, and fiber. They are also an excellent source of the vitamin A precursor, beta-carotene. One cup of the orange flesh types contains four times the recommended daily allowance of this important nutrient. It is expected that with improved curing and storage procedures and development of fresh shipping methods (wrapping of individual tubers in plastic ready for microwaving) and processed products such as sweet potato chips, fries, and canned sweet potatoes will enlarge the market. And they’re also good animal feeds. Sweet potato production and sales can also provide good income opportunities for farmers in some country sweet potatoes are an important export crop that can generate foreign exchange earnings.

1.9 STORAGE OF SWEET POTATO TUBERS (*Ipomoea Batatas* (L) Lam.)

The sweet potato holds great significance as a vital food source in numerous developing nations, owing to its remarkable versatility, rich nutritional content, and ability to thrive in diverse climates (Sawika *et al*., 2018). Due to its adaptability to a wide range of soil types and ability to thrive in challenging environmental conditions, the sweet potato plays a significant economic role in numerous countries worldwide, Tuber storage and quality preservation are the key elements in the supply chain. Insufficient availability of scientifically-proven and tested storage techniques, coupled with improper storage conditions, are primary factors contributing to the spoilage of sweet potato tubers immediately following harvest. During long-term storage of sweet potato tubers, biochemical and physiological processes take place resulting in qualitative and quantitative changes (Grace *et al.,* 2014), in temperate-climate regions, with production limited to the summer season and constant sales, sweet potato tubers can be stored throughout the entire year, provided that some conditions are met regarding temperature and ambient humidity in the storage room. Sweet potato tuber storage begins after tubers are harvested (Mbah and Okoro, 2015), Sweet potato should be harvested in rainless weather at a temperature over 5 °C (Amjad *et al.*, 2020), Harvested tubers should be carefully sorted according to size categories. Only healthy, undamaged tubers with mature, suberized skin are suitable for storage.

Sweet potato tubers are characterized by very thin, delicate skin that is prone to damage by cutting or scraping, so during harvest, it is recommended to use paper cartons filled with fewer tubers instead of polypropylene bags(Chakraborty *et al.,* 2017).Sweet potato storage period can be divided into stages with different recommended temperature and humidity; stage one is tuber maturation, stage two - cooling down and stage three - long-term storages (Dandago, 2011) in temperate climate, after harvest and prior to storage, sweet potato tubers should be stored at

12-18 °C for approximately 10 days. During that period, a protective layer of suberized cells forms in tubers, warding off microbes and preventing excessive moisture loss during storage (Tomlins *et al.,* 2011). The preservation of sweet potato tuber quality during storage is crucial for ensuring uninterrupted supplies to the food processing industry, especially for the production of juices, soups, and popular fried products like crisps and fries. This is not only essential for the industry itself but also to mitigate substantial economic losses.

1.10 AIM/OBJECTIVE OF EXPERIMENT

The objective of this research is to assess the storage capacity of sweet potato tubers sold in New Benin market, Edo state over a 40-day period. This aim will be achieved with the following objectives.

1. Evaluation of the microbial contents of stored tuber sweet potato.
2. Investigation of the physiochemical composition of stored tuber of sweet potato
3. Determination of the storability of sweet potato.

CHAPTER TWO

MATERIALS AND METHODS

2.1 PLANT MATERIAL

Two cream skinned Sweet potato tubers were obtained from new Benin market ,at New Benin road , Edo state.

Plate1: sweet potato tubers obtained from new Benin Market, Edo state.

2.2 METHOD OF STORAGE

The potato tubers were stored in a laboratory and kept on a sterile table for 40 days, they were stored at room temperature, the ideal temperature for sweet potato tubers is around 55 to 67 degrees Fahrenheit.

2.3 MICROBIOLOGICAL ANALYSIS

The microbiological analysis of the sweet potato tubers was carried out in a sterile laboratory using the following laboratory techniques of isolating microorganisms.

Materials used include, test tube, beaker, weighing balance, test tube, razor, distilled water, PDA, methylated spirit and conical flask.

Preparation of potato dextrose agar

Thirty nine grams of potato dextrose agar (PDA, Oxoid, England) was measured into a conical flask, and 500mls of water was added. The conical flask was then heated. After heating, additional 500mls of water was included to sum it up to to a volume of 1 liter. The medium was then sterilized by autoclaving at 15psi (1210C) for 15minutes. chloramaphenicol at 10gm per 200ml of medium was introduced at pouring to inhibit the growth of bacteria Inoculation and transfer of culture were carried out on sterile inoculating bench CRC model HSB 60*180, after wiping with methylated spirit.

Preparation of sterile water blank

Nine milliliters of distilled water was pipette into McCartney bottles representing each of the samples. The bottle was labeled S1 to S9. The bottles were the sterilized in an autoclaved at 1210C for 15 minutes. After sterilization, McCartney bottles were allowed to cool for serial dilution preparation.

Method of inoculation

The pour plate method of inoculation was used in the isolation of the microorganisms associated with the samples. One ml each of the serial dilution prepared samples was pipette with the aid of a syringe and was transferred into the corresponding labeled Petri dishes. Nine ml of molten prepared nutrient agar (NA) and potato dextrose agar (PDA) was dispensed into the Petri dishes respectively. The Petri dishes were inoculated under room temperature for 24hrs.

Determination of microbial load

The microbial load of the samples was determined by visibly by counting the colony forming unit after 24 hrs for bacteria and after 72hrs for fungi

The microbial load/ml was then determined by the formula stated below

Count/ml = No of colonies on plate × 1

Amount plated dilution factor.

Macroscopic identification of the fungal isolates

Colonies of Aspergillus niger associated with the POME sample were then subcultured into a freshly prepared PDA on Petri dishes, after growth it was then examined and identified based on their cultural and microscopic characteristics according to the methods described by Barnett and Hunter (1998) and Nyongesa et al (2015) and was used for further studies.

2.4 EVALUATION OF THE PHYSIOCHEMICAL COMPOSITION

The physiochemical evaluation of the sweet potato tubers was carried out in a sterile laboratory. The physiochemical composition evaluated from the sweet potato are moisture content, dry matter, vitamin C content and sugar content .

Materials used includes, beaker, conical flask, weighing balance, distilled water and test tube .

Moisture and dry matter

This method was done using the official methods of analysis (AOAC,2007)Two grams of the sample was weighed into a previously weighed crucible. The crucible containing sample was then transferred into the oven set at 100OC to dry to a constant weight for 24 hours overnight. At the end of the 24 hours, the crucible with sample was removed from the oven and transferred to dessicator, cooled for 10 minutes and weighed.

If the weight of empty crucible was Wo

weight of crucible plus sample was W1

weight of crucible plus oven-dried sample W3

$$(\%\ DM)\ \%\ \text{Dry Matter} = \frac{W3 - Wo}{W1 - Wo} \times 100$$

% Moisture = $\frac{W1 - W3}{W1 - Wo}$ x 100

or % Moisture = 100 – % DM.

Determination of Acidity, Titratable acidity and Vitamin content

This was done according to the methods described by Ivanesa et al. (2016) on the sensory evaluation Solanum tuberosum L

Acidity

This was done by measuring 10 gm of the S. tuberosum in a suitable titration flask and dissolve in 75 ml of carbon dioxide free water. Mix thoroughly. The mixture was then titrated against standard sodium hydroxide solution using 4-6 drops of phenolpthalein indicator till pink colour persists for 10 seconds. The control sample was determined blank on water and indicator and corrects the volume of sodium

Titratable acidity

10mls of crushed S. tuberosum sample crushed in water was transferred into a clean Erlenmeyer flask and 2 drops of 1% phenolphthalein indicator solution and a magnetic stir bar before stirring on a magnetic stir plate. Then 0.1N NaOH was carefully titrated against the sample solution to the end point of pH 8.2 until a faint but definite pink colour, which was stable for 5 to 10 seconds was obtained. The titrable acidity was calculated using the equation:

% acid = [mls NaOH used] x [0.1 N NaOH] x [milliequivalent factor] x [100]

grams of sample

Where V is volume (ml) of NaoH solution used for titration

N = Normality of NaoH solution, meq.

wt is milliequivalent weights of acid: lactic acid (0.067)

Vs= sample volume

The analysis was performed in triplicate to find the mean titrable acidity of each sample.

Vitamin C

Estimation of ascorbic acid in S. tuberosum was done by measuring a known amount of the sample into a conical flask. 40mls of 0.01 mol of potassium iodate was added to the solution. The reaction mixture was shaken well and kept aside at room temperature for about 30 min followed by the addition of 1 ml, 2N sulfuric acid , 1 ml 10% potassium iodide and 2ml water. The liberated iodine was titrated against standard sodium phosphate solution (0.01M) using starch as an indicator. Similarly, a blank titration was conducted. From the difference in the volume of sodium thiosulphate solution consumed, the amount of vitamin C 'W' present was calculated using the following equation:

$$W = \frac{m(V1-V2)M}{2000}$$

where M- molarity of sodium thiosulphate, V1 and V2 –volume of sodium thiosulphate consumed for experimental and blank titration, m-molecular weight of the ascorbic acid .

Determination of total sugar

Phenol solution

25 g of phenol (Mallinckrodt, A.R.) was dissolved in 400 ml of water and diluted to make 500 ml of solution.

Glucose stock solution

10 mg of D glucose was dissolved in 80 ml of water and diluted to make 100 ml of stock solution (100 ug/ml). 1ml aliquot of the above was pipetted into a test tube and 1ml water as blank was

pipetted into another test tube. 1ml of 5% phenol solution was added and shaken followed by the careful addition of 5ml 96% H2SO4to shake on a shaker vigorously for 2 minutes and cooled. Standard glucose solutions of range 10-50µg/ml were treated with 5% phenol and H2SO4 as above.

The absorbance of the golden yellow color solution of the sample and glucose standard were read on a spectronic 21D spectrophotometer at wavelength 490nm against the blank. (AOAC 1990) the total soluble sugar was determined using the standard curve.

CHAPTER THREE

RESULTS

Table 1: Effect of storage condition on some physiochemical parameters of stored Potato tubers.

Parameters	Control	40days
Moisture content	42.5%	44.5%
Dry matter content	57.5%	55.5%
Titratable acidity	0.02%	0.05%
Vitamin C content	2.2mg	1.23mg
Sugar content	8.25 ug/ml	3.50ug/ml.

Table 2 : microbiological evaluation of Fungi isolated from the stored sweet potato tubers.

Fungi	Control	40days
Aspergillus sp	+	+
Rhizopus sp.	+	+
Lasidiopodia sp.	-	+
Rhizotonia sp	-	+
Macrophomina sp.	-	+

Key

-=Absent

+= present

plate 2: sweet potato tubers after 40 days of storage

CHAPTER FOUR

DISCUSSION

The current study was done to determine the storability of sweet potato tubers obtained from New Benin market, Edo state, the storability was determined by evaluating the physiochemical and microbiological components of the stored sweet potato tuber, During this study two sweet potato tubers were obtained from New Benin Market, Edo state and stored in a sterilized laboratory at room temperature for 40 days. Physiochemical tests was conducted on a sweet potato tuber immediately after it was obtained, and the results were used as the control for the experiment, the other sweet potato tuber was stored in the laboratory and after 40 days the same physiochemical tests was carried out on potato tuber. The physiochemical components examined are moisture content, dry matter content, titratable acidity, Vitamin C and sugar content as shown in **Table 1** . The moisture content refers to the amount of water present in the sweet potato tuber expressed as a percentage of the total weight, Dry matter in sweet potato tubers refers to the portion of the tuber that remains after removing the moisture content. It represents the solid, non-water components of the sweet potato,in this study the moisture content was measured by calculating the percentage of the moisture and the Dry matter content is expressed as a percentage and is calculated by subtracting the moisture content from 100%**.** The moisture content of the sweet potato tuber in this study is 42.5% after 40 days it increases to 44.5% and the dry matter content is 57.5% after 40 days it reduces to 55.5%, the moisture content is inversely proportional to the dry content. Under good storage conditions the moisture content of sweet potato tuber increases, in this study the moisture content increases over time this was caused by condensation in the Laboratory, which was as a result of flunctuation in humidity levels. Titratable Acidity Titratable acidity (TA) in sweet potato tubers refers to the measurement of the total amount of acid present in the potato tubers. It is determined through titration, the acidity of sweet potato tubers increases over time, the Titratable acidity of sweet potato tuber in this study is 0.02% after 40days it increases to 0.05, sweet potato is a good source of vitamin C, the Vitamin C content of the sweet potato reduces over time ,during storage sweet potatoes can experience a gradual decline in their vitamin C content. Factors such as temperature, humidity, and exposure to air can accelerate the degradation of vitamin C. The longer sweet potatoes are stored, the greater the potential for vitamin C loss. In this study the Vitamin C content is 2.2mg and it reduces to 1.1mg after 40 days of storage ,sweet tubers contains natural sugars The sweetness of sweet potatoes comes from a natural sugar called sucrose. Additionally, sweet potatoes also contain small amounts of other natural sugars such as glucose and fructose. The exact sugar content can vary depending on factors such as the variety of sweet potato and their ripeness. In this study the sugar content is 8.25ug/ml after 40 days the sugar content reduced to 3.50ug/ml this is as a result of microbial and enzymatic activity, that break down complex carbohydrates and sugars during storage.It's important to note that the sugar in sweet potatoes is primarily in the form of complex carbohydrates, which are metabolized more slowly by the body compared to simple sugars found in processed foods and sweets.

The microbiological evaluation of sweet potato sugar for this study was carried out in a sterile laboratory, after obtaining two potato tubers from New Benin market, Edo state, microbiological tests were carried out on a potato tuber the result was used as a control for this study , after 40 days of storage the same microbiological tests were carried and the results were recorded as shown in **Table 2.** *Aspergillus sp*. and *Rhizopus sp* were the only fungi present in the sweet potato tuber at the first day of storage, after 40 days *Lasidiopodia sp, Rhizotonia sp,* and *Macrophomina sp* were present . The presence of these fungi can be attributed to various factors Environmental contamination and improper storage conditions. These fungi are ubiquitous and can be found in air, soil , and organic matter, sweet potatoes are susceptible to fungal infections during storage, and these fungi can lead to stem and root rot diseases in sweet potato tubers, if sweet potatoes are stored in damp or warm conditions, it can promote the development of fungal diseases by these pathogens.In this study, the presence of L*asidiopodia sp, Rhizotonia sp*, and *Macrophomina sp* signifies that spoilage of the sweet potato tuber has occurred.

CONCLUSION

According to the findings of this study, there was minimal variation in the physiochemical characteristics of stored sweet potato tubers, even after a storage period of 40 days. This indicates that sweet potato tubers possess excellent storage capabilities. Although spoilage occurred after 40 days due to fungal infection , the tubers still maintained a significant portion of their essential nutrients.

REFERENCES

Amjad, A., Javed, M.S., Hameed, A., Hussain, M., Ismail, A. (2020). Changes in sugar contents and invertase activity during low temperature storage of various chipping potato cultivars. *Food Science Technology*. **40**: 340-345.

Angiosperm Phylogeny Group (2009): An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. *Botanical Journal of the Linnean Societv*, **161:** 105-121.

Austin, D.F., 1988. The taxonomy, evolution and genetic diversity of sweet potatoes and related wild species, In: P. Gregory (Ed.), *Exploration, maintenance, and utilization of sweet potato genetic resources*, pp. 27-60. Inti. Potato Ctr., Lima, Peru

Barnett HL, Hunter BB (1998). Descriptions and Illustrations of genera. Illustrated Genera of Imperfect fungi. *The Amer. Phytopathol*. Soci. press. St. Paul Minnesota. pp. 59-218

Brunt, A. A., Crabtree, K., Dallwitz, M. J., Gibbs, A. J. and Watson, L. (1996). Viruses of Plants. *Descriptions and Lists from the VIDE Database*. CAB International, Wallingford, UK.

Cambridge University Press, Cambridge, UK.. International Potato Center (CIP), 1998. Sweetpotato Facts. International Potato Center, Lima, Peru.

Chakraborty, C., Roychowdhury, R., Chakraborty, S., Chakravorty, P., Ghosh, D. A (2017). Review on Post-Harvest Profile of Sweet Potato. *Int. J. Curr. Microbiol. Appl. Sci*. **6:** 1894-1903.

Chavi F. Robertson AL, Verduin BJM, (1997). Survey and Characterization of Viruses in Sweet Potato from Zimbabwe. *Plant Disease*. **81:** 1115-1122.

Clark, C. A., Davis, J. A., Abad, J. A., Cuellar, W. J., Fuentes, S., Kreuze, J. F., Gibson, R. W., Mukasa, S. B., Tugume, A. K., Tairo, F. and Valkonen, J. P. T. (2012). Sweet potato viruses: 15 years of progress on understanding and managing complex diseases. *Plant Diseases* **96:** 168-185.

Dandago, M.A.; Gungula, D.I. Effects of various storage methods on the quality and nutritional composition of sweet potato (Ipomoea batatas L.) in Yola Nigeria. *Int. Food Res. J.* 2011, **18:** 271-278.

Etong DI, Mustapha AO, Lawrence IG, Jacob AG, Oladimeji MO (2014). Nutritional and Physicochemical Properties of Wheat (Triticum vulgare), Cassava (Manihot esculenta) and Sweet Potato (Ipomoea batatas) Flours. *Pak. J. Nut.* **13(8)**:439-445.

Grace, M.H.; Yousef, G.G.; Gustafson, S.J.; Truong, V.-D.; Yencho, G.C.; Lila, M.A. (2014). Phytochemical changes in phenolics, anthocyanins, ascorbic acid, and carotenoids associated with sweet potato storage and impacts on bioactive properties. *Food Chem.* **145:** 717-724.

Huamán, Z. & D.P. Zhang, 1997. Sweetpotato. Biodiversity in Trust - Conservation and Use of Plant Genetic Resources in CGIAR Centers, pp. 29-38.

J.B. Edmond, G.R. Ammerman. Sweet potatoes: production, processing, marketing. In Major feed and food crops in agriculture and food series *.The AVI Publishing Company* Westport, Connecticut, 1971, 334.

J.B.C. Silva, C.A. Lopes, J.S. Magalhães. Batata-doce Ipomoea batatas Lam.). Embrapa Hortaliças, *Sistemas de Produção*, 6. 2008.

Laurie SM, van Jaarsveld PJ, Faber M, Philpott MF, Labuschagne MT (2012). Trans-b-carotene, selected mineral content and potential nutritional contribution of 12 sweet potato varieties. *J. Food Compost. Anal*. **27:** 151-159.

Mbah, E and Okoro, O.E. (2015). Relationship between some growth parameters, dry matter content and yield of some sweet potato genotypes grown under rainted weathered ultisols in the humid tropics. *Agron*. **14:** 121-129.

Mukasa SB, Rubaihayo PR, Valkonen JPT, (2003). Incidence of Viruses and Virus-likeDiseases in Sweet Potato in Uganda. *Plant Disease* **87:** 336-340.

Nyongesa, B.W., Okoth, S and Ayugi, V(2015) Identification Key for Aspergillus Species Isolated from Maize and Soil of Nandi County. **Kenya Advances in Microbiology, 5:** 205-229.

Oloo BO, Shitandi A, Mahungu S, Malinga JB, Ogata BR (2014). Effects of Lactic Acid Fermentation on the Retention of Beta-Carotene Content in Orange Fleshed Sweet Potatoes. *Int. J. Food Stud.* **3:** 13-33.

Physico-chemical and sensory evaluation of potato (Solanum tuberosum L.) after irradiation Ivanesa G.M. Soares1, Edvane B. Silva1,2, Ademir J. Amaral1, Erilane C.L. Machado2 and Josenilda M. Silva3 ,*Annals of the Brazilian Academy of Sciences* (2016) **88**(2): 941-950

R.V. Jean. Phyllotaxis: a systemic study in plant morphogenesis. *Cambridge University Press*, 2009, 404.

Roger. H. 2009. Comparative Plant Virology 2nd Edition, Academic Press, San Diego, CA. Karyeija RF, Gibson RW, Valkonene JPT, 1998. The significance of sweetpotato feathery mottle virus in subsistence sweetpotato production in Africa. *Plant Disease vol*. **82:** 4-15.

Sawicka, B.; Michalek, W.; Pszczólkowski, P.; Danilcenko, H. Variation in productivity of Ipomoea batatas at various rates of nitrogen fertilization. *Zemdirb. -Agric.* 2018, **105:** 149-158.

Tairo F. 2006. Molecular resolution of genetic variability of major sweetpotato viruses and improved diagnosis of poty viruses co-infecting sweetpotato. Doctoral diss. Dept. of Plant Biology and Forestry Genetics, *SLU. Acta Universitatis agriculturae Sueciae.*

Tomlins, K.; Rees, D.; Coote, C.; Bechoff, A.; Okwadi, J.; Massingue, J.; Ray, R.; Westby, A. Sweet potato utilization, storage, small-scale processing and marketing in Africa'. In Sweet Potato: Post Harvest Aspects in Food, Feed and Industry; Ray, R.C., Tomlins, K.I., Eds.; *Nova Science Publishers, Inc*.: New York, NY, USA, 2010; pp. 271-293.

USDA (U.S. Department of Agriculture), Agricultural Research Service (2009). *USDA National Nutrient Database for Standard Reference*

Yen, D.E., 1982. Sweetpotato in historical perspective. In: R.L. Vil-lareal & T.D. Griggs (Eds.), SweetPotato, Proceedings of First International Symposium, *AVRDC Publ.* No. 82-172 Tainan, Taiwan, China, pp. 17-30.

Z. Human. Descriptors for sweet potato International Board for Plant Genetic Resources-IBPGR, Centro International de la Papa-CIP, *Asian Vegetable Research and Development Center-AVRDC,* 1991, 134 p., 1991.

Z.Human. Systematic botany and morphology of the sweetpotato plant technical formation Bulletin25. *International Potato Center-Peru*, 1992, 22.