UTILIZATION OF LOCAL TOMATO IN PRODUCING TOMATO PUREE

By

AKINLOSE PETER OPEYEMI
HND/23/HMT/FT/0101

DEPARTMENT OF HOSPITALITY MANAGEMENT,
INSTITUTE OF APPLIED SCIENCES,
KWARA STATE POLYTECHNIC,
ILORIN

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF HIGHER NATIONAL DIPLOMA (HND) IN HOSPITALITY MANAGEMENT, KWARA STATE POLYTECHNIC, ILORIN

JULY, 2025

CERTIFICATION

This project has been read and approved by the undersigned on behalf of the Department of Hospitality Management, Institute of Applied Sciences (IAS), Kwara State Polytechnic, Ilorin as meeting the requirement for the Award of Higher National Diploma (HND) in Hospitality Management.

_____ _____

AIYEDUN C.F (MRS.) **Date**
(Project supervisor)

_____ _____

HARUNA Z.A.B (MRS.) **Date**
(Project coordinator)

_____ _____

AREMU O.O (MRS.) **Date**
(Head of Department)

_____ _____

External Examiner **Date**

DEDICATION

This project is dedicated to Almighty God, the Omnipotent and Omniscience who has spared my life from the inception to the end of my academic programme and who will continue to be with me till the end of my life.

ACKNOWLEDGEMENTS

All thanks, praise and adoration are due to the Almighty God, the uncreated creator of all creature, the intelligent who sought intelligence from no one and nothing supersedes His authority on earth and beyond.

My special appreciation goes to my tested and trusted project supervisor Mrs. Aiyedun C.F. who have strictly and perfectly monitored my project work and for her advice to ensure a perfect work, also to the H.O.D Mrs. Aremu O.O. and Coordinator Mrs. Haruna Z.A.B.

My outmost gratitude goes to my loving and untiring parent Mr. and Mrs. Akinlose for their consistent prayer and godly advice.

Also to my lovely unforgettable siblings for their words of advice and support, may God continue to increase you in wealth and health.

Lastly, these categories of special people who have been of tremendous assistance to me diverse ways during the course of my programme, Mr. Oseni Ridwan, Mr. Afolabi V.A, Mr. Daodu M.O, Miss. Oketope B.T and also to my friends in the department which I cannot continue to mention their names one after the other. May God be with you in all your various endeavours (Amen).

ABSTRACT

This study investigates the utilization of local tomato in the production of tomato puree, focusing on its feasibility, efficiency, and potential for enhancing local agricultural value chains. The research aims to assess the physicochemical properties, processing techniques, and sensory attributes of tomato puree derived from locally grown tomato varieties. Nigeria, being one of the largest producers of tomatoes in Africa, still faces post-harvest losses and heavy dependence on imported tomato paste. This study therefore explores how locally sourced tomatoes can be effectively harnessed for puree production, thus promoting food security and reducing importation. Fresh, ripe tomatoes sourced from local farms were processed using standard puree production techniques, including washing, blanching, pulping, concentrating, and packaging. The resulting puree was evaluated for quality parameters such as pH, viscosity, color, total soluble solids, and microbial load. Sensory evaluation was also conducted to assess taste, texture, color, and overall acceptability. Results indicated that local tomatoes are highly suitable for puree production, yielding a product with favorable physicochemical and sensory characteristics comparable to commercial standards. The findings support the potential for small- and medium-scale food processors to utilize local tomatoes as a sustainable raw material for value-added tomato products. The study recommends investment in processing infrastructure and training for local farmers and processors to optimize the quality and quantity of tomato puree produced locally.

Keywords*: Local tomato, tomato puree, value addition, food processing, Nigeria, sensory evaluation,* post-harvest loss.

TABLE OF CONTENTS

CHAPTER ONE

BACKGROUND OF THE STUDY

1.1 Introduction to the Study

Tomato (Lycopersicon esculenng) is a cultivated solanaceous crop that originated from Perou. It is very cultivated in different countries for its edible red fruit. The national production of Benin is closer to 140.000 tonnes while south-Benin alone provides more than 70% of the total production (DPPMDR 2019). Seasonal production lasts three to four months. Losses from tomatoes production amount to 40% when the total expenditure related to the imports of substitutes reaches in 1999 nearly 7.5 billion FCFA including 7.3 billion for tomato purees (Soulé. 2018). The price of a kilogram of tomato fruit varies between a minimum of 15 to 170FCFA and a maximum of 90 to 500FCFA. Tomato is the most cultivated variety (Falohun and Kiki, 2019). The only form of conservation was drying. However technological characteristics of this variety of tomato are closer to standard required for its processing into puree on industrial scale.

Tomato (Lycopersion esculentum) is grown in our country (Nigeria) in abundance; both in summer and winter seasons, but those grown in winter are superior in quality because they contain more total solids. They are a good source of vitamin C. Fresh tomatoes are very refreshing and appetizing but cannot be stored for a long period. It is estimated that a loss of about 25% of the produce occurs due to lack of post-harvest handling operations in India. Under this situation, production, storage/transport of an intermediate product would help in reducing the huge post-harvest losses and would be highly beneficial to the development of processing industry. But, sophisticated technology for bulk storage of tomato pulp, has limited application in Indian, due to higher costs involved. The intermediate products which would help the farmer to get more profit from the crop. Often they are sold at distress prices during the peak harvest season and huge percentage of

the produce is spoiled due to mishandling. Such losses can be avoided by converting tomatoes in to delicious products.

The World annual production of tomato (about 160 billion tons) is situated in the eleventh place between the commodities with greater world production (FAOSTAT 2019). As an example, the tomato production in 2012 for Spain was about 4 million tons, and the Region of Murcia (from south-east of Spain) produced around 30% of the total from Spain (MAGRAMA, 2018).

This high tomato production. points to this commodity as an important component in the population diets. In particular, it is a key component of the Mediterranean diet, which is recognized as a healthy diet, especially in comparison with other typical diets from Northern European and American consumers (Wei 2019), tomato are due to its content in minerals, flavonoids, and vitamins E and C, among others, but its high content in carotenoids, particularly lycopene, has also an especially relevant role (Wei 2019).

Lycopene (C40H56) is the carotenoid hydrocarbon that gives tomatoes their red colour. It is a hydrophobic and acyclic carotenoid possessing conjugated and 2 non conjugated double bonds, and is located in the photosynthetic pigment protein complex of the thylakoid membrane in tomatoes (Willcox 2018). Particularly, this system of conjugated double bonds makes lycopene susceptible to enzymatic (intestinal enzymes) or chemical (i.e. potassium permanganate and metalloporphyrins) oxidative cleavage and isomerization from all-trans to cis-forms (Muller 2017).

Oxidation may occur by auto-oxidation, which is a spontaneous free radical chain reaction in the presence of oxygen, or by photo-oxidation produced by oxygen in the presence of light. These oxidative reactions may result in carotene bleaching, which is the cause of the formation of colourless end products (Gross 2019). During

auto-oxidation of carotenoids, alkylperoxyl radicals are formed, and these radicals attack the double bonds resulting in the formation of epoxides.

The intensity of oxidation, and consequently the content of oxidation by-products, depends on the structure of carotenoids and the environmental conditions (Ramakrishnan 2019). The most commonly identified forms of lycopene isomers are all-trans (also named as all-E-lycopene), and 5-cis, 9-cis, 13-cis, and 15-cis (also named as 5-Z., 9-Z-, 13-Z-, and 15-Z-lycopene) (Colle 2019). Oxidation is undesirable because it leads to lycopene degradation and a concomitant loss of its healthy properties (Rodriguez 2018). On the other side, lycopene isomerization is desirable because the cissomers of lycopene have a highet antioxidant activity.

Furthermore, cis-isomers (or Z-isomers) are more easily taken up by mixed micelles in the intestine, and hence are more bioavailable compared to all-trans-lycopene. The lycopene content in fresh tomatoes and their products has been reported to range from 2.5 to 670 mg 100 g-1 fresh weight (fw) (Akbudak 2018). Considering the different tomato parts, the lycopene content is very variable depending on the tissue and ripening stage.

The maximum levels are reached on red tomatoes (254-2,787 Ig g-1 dry weight (dw)), while green tomatoes have very low content (2 lg g-1 dw). The tomato cultivar also has great influence on the lycopene content of the different parts of the fruit. For example, Rama and Redondo tomato cultivars showed up to 58% (pulp without peel) and 46% (pulp without seeds) lower lycopene contents than Cereja and Chucha cultivars (Vinha 2019).

Lycopene is not synthesized de novo by the human body and must thereforcibe obtained from the diet (Bramley 2019). Different epidemiological studies suggested an inverse relationship between diets rich in lycopene and the risk of chronic diseases including different types of cancers (Vinha 2019) and cardiovascular diseases).

The main objective of this work is utilization of local tomato in the production of tomato puree.

1.2 Statement of the Problem

Utilization of local tomato in the production of tomato puree is one of the problems facing the user of tomato, as some of the users does not have insight knowledge on the method in which local tomato can be used in the production of tomato puree. This research will vividly shed more light on the modernized way in which local tomato can be used in the production of tomato puree.

1.3 Aim and Objectives of the Study

The objective of the study is to examine the utilization of local tomato in the producing various tomato puree. Other objectives will be looked into which are:

i. To utilize fresh tomatoes into tomato puree
ii. To compare the research processed puree with the available tomatoes
iii. To find out the acceptability level of the research puree and the one in market

1.4 Research Questions

In the course of this research work, the following research questions are being brought up:

i. What is the production method of tomato puree using local tomato?
ii. What are the research process of puree with the available tomato?
iii. What is the acceptability level of the research puree and the one in market?

1.5 Significance of the Study

The result of this research work will be at great benefit to the user of tomato, as it will help them to know how the local tomato can be used in making tomato puree.

It will also serve as a subsequent research to researchers who are interested in the topic of the study, it will also be of immense value to the hospitality Industry as a whole.

1.6 Scope of the Study

The research produced principally utilization of local tomato in production of tomato puree. In Northern Nigeria they are found most commonly in markets during the rainy season. Statistical data on production and trade are not available.

1.7 Limitation of the study

In caring out this research project, the researcher encounters the following inhibitions:

Financial constraint- Insufficient fund tends to impede the efficiency of the researcher in sourcing for the relevant materials, literature or information and in the process of data collection (internet, questionnaire and interview).

Time constraint- The researcher will simultaneously engage in this study with other academic work. This consequently will cut down on the time devoted for the research work.

It should be noted that the limitation does not hinder the quality of this research work.

1.8 Definition of Terms

TOMATO: Although usually called a vegetable and eaten as such, the tomato is actually a fruit that can be eaten raw or cooked. It might be red or yellow in various sizes, and comes in shapes from round to pear-shaped.

PUREE: A paste or thick liquid suspension usually made from cooked food ground finely

MILITATING: (Of a fact or circumstance) be a powerful or conclusive factor in preventing

PRODUCTION: The action of making or manufacturing from components or raw materials, or the process of being so manufactured

UTILIZATION: The amount of something available, produced, etc. compared with the total amount that exists or that could be produced:

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The tomato (Solanum lycopersicum) with a production of 161,793,834;t in 2012, was the vegetable with the second highest worldwide production after potatoes (364,808,768 t). China being the country with the highest production with 50,000,000 t, followed by India (17.5 million t), United States (13,206,950), Turkey (11,350,000), and Egypt (8,625,219 t). In 2019, globally presented a value of U.S. $725,685,929 (FAOSTAT Database 2018).

It is considered that the domestication of tomato started with the Aztec and Inca cultures where it was used as part of regular diet and its production and consumption grew at the same level as the population did. Nowadays tomato is sold fresh and also processed in several products like soups, pastas, concentrates, juices, and ketchup. Several studies show its nutritional content as a rich source of lycopene, ß-carotene, and vitamin C, some of which are maintained after its processing, providing important components for human health (Bergougnoux 2019).

2.2 Properties of Tomato

Tomato contains of 93.4%-94.5% water, 0.85%-4.6% sugar, 0.78%-0.88% protein, 0.2%- 0.3% fat, minerals, mainly potassium, and is a rich source of other nutrients such as ascorbic acid (vitamin C) and antioxidants compounds of carotenoids family like lycopene and B-carotene (Rao and Agarwal 2018). In addition, fresh tomato and its derivative products provide the following carotenoids: violaxanthin, neoxanthin, lutein, zeaxanthin, a-cryptoxanthin, ß-cryptoxanthin, a-carotene, B-carotene, y-carotene, &-carotene, neurosporene, phytoene, phytofluene, cyclolycopene, and B-carotene 5,6-epoxide.

The importance of carotenoids as antioxidants is that they can delay or control the oxidation of lipids or other molecules to inhibit the onset of reactions in oxidative chain (Yahia et al. 2018). The a-carotene, B-carotene, and B-cryptoxanthin have

provitamin A activity to become retinal (Guil-Guerrero and Rebolloso-Fuentes 2019). Lycopene consumption prevents lung, prostate cancer, and digestive tract (Mourvaki et al. 2020). In the same way, tomato consumption has been associated with a lower probability of breast cancer (Zhang et al. 2019) also for head and neck cancer and helps to protect against neurodegenerative diseases (Freedman et al. 2018). Epidemiological studies have shown that lycopene acts to protect cells from the effects of oxidation and oxidative damage (Mourvaki et al. 2020). Sauces and puree may be of help to lower urinary tract symptoms of Benign Prostatic Hyperplasia (BPH) and may have anticancer properties (Polívková et al. 2018). Tomato consumption might be beneficial for reducing cardiovascular risk associated with type 2 diabetes (Shidfar et al. 2019).

It is known that the nutrient content and antioxidant activity of tomato may vary depending on variety and growing conditions (Guil-Guerrero and Rebolloso-Fuentes 2019). Tomato fruits that grow on organic substrates containing significantly higher contents of Ca and Vitamin C, present less Fe compared with the fruit grown in hydroponic medium, whereas the content of P and K does not vary in fruits grown either in an organic or in hydroponie substrate (Guil-Guerrero and Rebolloso-Fuentos 2019). It was found that wild tomato variety contains five times more ascorbic acid than MVs (Bergougnoux 2018).

Guil-Guerrero and Rebolloso-Fuentes (2019) compared the nutrient composition and antioxidant activity of mature fruits of eight varieties of tomatoes (Cherry, Pear, Daniela Long Life, Lido, pear, Bunch, Raf, and Rambo) that were grown in a greenhouse, and found that they varied mainly in the content of vitamin C as follows: 39 mg/100 g fresh weight (FW) in the variety Cherry Pera, and 263 mg/100 g FW in the Rambo variety. On the other hand, the values for the content of moisture, crude protein, available carbohydrate, and neutral detergent fiber were similar for the commercial varieties of tomatoes.

2.2.1 Quality of Tomato

Lycopene and B-carotene act as antioxidants and also are related to the color and quality perception (Heredia et al. 2019). During the ripening process, the fruit and; vegetables undergo physicochemical changes that primarily affect its texture, flavor, color, and sugar content. The color change is the main indicator of maturity stages, which is related to the synthesis or degradation of lycopene (Cheng et al. 2019).

Tomato quality is not only related to the taste, texture, and appearance, but also other features such as the product's ability to harvest, transport, and processing. The strength and resistance of the skin are the most important properties of the fruit in the characterization of the quality of processed tomatoes, especially in the packaging industry (Arazuri et al. 2018). Batu (2018) studied the minimum acceptable value for the firmness and color of tomato from two varieties "Liberto" and "Criterium." Two possible values for the minimum limit for fruit firmness were suggested: commercial value, which was related to very firm tomatoes having firmness values above 1,45 N mm and tomatoes suitable for consumption at home should have firmness values greater than 1.28 N mm. In order to determing the color, the most common method is measuring the difference in color using the Minolta Chroma meter model. The Minolta a*/b* were less variable for mature green and breaker stages. When the fruit reached Minolta a*/b*, from 0.60 to 0.95, in the light red stage, the fruits can easily be marketed. Red stage corresponded to too mature stage with Minolta a*/b* values between 0.95 and 1.21 (Batu 2018).

2.2.2 Production and Handling of Tomato

The physiological process of fruit ripening, lycopene accumulation, red colgration indicating full maturity also presenting important biochemical reactions, such as the accumulation of sugars and volatile compounds as well as cell wall degradation, resulting in the loss of firmness and consequently reduced sbelf-life. Being a climacteric fruit, ripening begins by increased respiration and ethylene biosynthesis (Bergougnoux 2018).

The inadequate agronomical handling of the crop has an impact in the environment and after-harvesting quality of the fruit. The world's yield of food comes from intensive agriculture, which is based on the application of agrochemicals; vegetables are the crops where more fertilizers and pesticides are used, due to the high volume of food produced and the succulence of the fruit that make them more susceptible to plagues and diseases. Big quantities of fertilizers based on nitrogen, phosphorus, and potassium are applied in tomato in higher doses that those recommended by research centers.

2.2.3 Use of Biofertilizers in the Production of Tomato

Mineral fertilizers present collateral effects adverse to the environment and health. This requires the development of new biorational options, such as biofertilizers (Rabie and Humiany 2019). It is essential to assume a strategy of nutrient supply to the crops by the means of an intelligent combination of inorganic and biologic fertilizers, all within the sustainability framework, to reduce damages in the environment, human, and animal health. The attainment of biofertilizers along with growth biostimulators and vegetable performance constitutes basic cornerstones that lead to an adequate and economically reasonable use of the different agricultural productive systems (Fundación Produce 2019).

The growth promoter bacterium (GPB) has received a great deal of attention for its potential to stimulate the development and health of vegetables.

2.2.4 Pest Management in Tomato

Spraying insecticides is suggested when multiple eggs are viable for plant and/or the first larvae damage fruit. For armyworm, recommended primarily for the management of this pest biological insecticides based on Bacillus thuringiensis as Dipel and Biobit at a rate of 1.0 kg/ha and baculovirus NPV zea (Gemstar) at the dose suggested by the manufacturer, when appear small third instar larvae and juveniles.

Among synthetic insecticides may be used, diflubenzuron (Dimilin), chlorpyrifos (Lorsban), cyhalothin (Karate), methomyl (Lannate), chlorfenapyr (Sunfire), benzoate

emamêctin (Proclaim), and methamidophos (Tamaron) at the dose indicated on the label. The fruitworm has a more varied and abundant enzyme complex than the corn earworm, making it more difficult to control with insecticides, especially selected very fast populations resistant to pyrethroid insecticides, so a general measure is not recommended to use insecticides of this group until after the middle of crop development and preferably only once (Cortez 2019). Currently control of major pests (leaminer larvae, worms, moths, aphids, prawns, bugs, and cicadas) that attack tomato crop, the following insecticides and bio-insecticides.

2.3 Nutritional Benefits of Tomato

Tomato is a warm season crop and is ranked highest in comparison of crops and its contribution of nutrients to the diet. Tomatoes also provide potassium, iron, phosphorus, and B vitamins and are good source of dietary fiber. The ripe tomatoes are red in color because they contain lycopene and other natural antioxidants are carotene, anthocyanin, ascorbic acid (vitaminC), vitamin E, phenolics, flavonoids.

Antioxidants have anti- inflammatory, anti-allergic and anti-thrombotic properties and beneficial in lowering the incidence of cardiovascular problems, cancer and neurological pathologies.

Water comprises 90% of the fresh weight of tomato fruit and the size of the fruit is influenced by the availability of water to the plant. The presence of large amount of water in the fruit makes it perishable. As the tomato fruit develops, starch decreases while carbohydrates such as sucrose and reducing sugars increase. Sugars are mostly found in ripe fruit and starches in unripe fruit. In a ripe tomato, solids form about 5-7% of the total fruit weight. About half of the solids comprise sugars and one eighth is acids. The main sugar in tomatoes is glucose. Citric acid is the main acid in tomato juice; and the pH of fruit is normally between 4.0 and 4.5.

2.3.1 Health Benefits of Tomato

Health benefits of tomato include eye sight, good gut health, low hypertension, diabetes, skin problems and urinary tract infections. Tomato is considered both a fruit and vegetable and forms an integral part of the cuisine all across the globe especially in the Mediterranean region. Daily consumption of tomato provides a great boost to health apart from improving the flavour of food. It consists of a large number of antioxidants which have been proven to fight different forms of cancer. It is a rich source of vitamins and minerals and exerts a protective effect against cardiovascular diseases, It also improves eye health and prevents hypertension and urinary tract infections.

The following are some of the health benefits of tomato

- Diabetes: Tomatoes also have plenty of the mineral chromium, which helps diabetics to keep their blood sugar level under control.
- Kidney stones and gallstones: Eating tomatoes without the seeds has been shown in some studies to lessen the risk of gallstones and kidney stones.
- Heart Troubles: Due to potassium and vitamin B, tomatoes help to lower blood pressure and to lower high cholesterol levels. This, in turn, could help prevent strokes, heart attack and other potentially life-threatening heart problems.
- Cancer: Various studies have shown that because of all that lycopene in tomatoes, the red fruit helps to lessen the chances of prostate cancer in men, and also reduces the chance of stomach cancer and colorectal cancer. Lycopene is considered somewhat of a natural miracle anti-oxidant that may help to stop the growth of cancer cells. And, interestingly enough, cooked tomatoes produce more lycopene than do raw tomatoes, so enjoy that tomato soup.
- Smoking: No, tomatoes can't help you stop smoking, but what they can do is to help reduce the damage smoking does to your body. Tomatoes contain chlorogenic acid and coumaric acid, which help to fight against some of the carcinogens brought about by cigarette smoke.

2.4 Technology and Processing of Tomato Products

Around the world, to produce canned tomatoes, ketchup, tomato juice, sauces, and many other products, 33,197 million t of tomato were processed in 2013 (WPTC 2019). To produce tomato paste, fruit passes through several steps such as washing, breaking, and removal of skin and seeds by sieving. concentration, packaging, pasteurization, and finally stored. Heat processing for inactivation of microorganisms and softening the fruit pulp to separate the epicarp usually use temperatures above 90°C, whereby the inactivation of pectinolytic enzymes is raised. It is well known that pectin methylesterase and endopolygalacturonase causes a reduction in viscosity and lipoxygenase participates in the production of aroma:

In contrast, at tempèratures below 70°C, the enzyme activity is maintained resulting in a lower viscosity and undesirable compounds. Other components that influence the viscosity of the final product (tomato juice, ketchup, soups, and pasta) are insoluble solids, these are comprised of cell wall components and proteins, same as in fruit determine the firmness (Bergougnoux 2019). Furthermore, for the production of tomato paste, the tomato is homogenized at high temperatures where ingredients like water, starch, and vegetable oil are used. The thermal treatment cause photochèmical reaction with subsequent degradation of antioxidant components, and thus the nutritional quality of the product is altered. Moreover, the presence of vegetable oil in sausage may allow lipid oxidation, contributing to the oxidation reactions (Chanforan et al. 2018).

Furthermore, the processing conditions may also induce the transition metal ions of the stainless steel equipment into the product. Consequently, carotenoids (E)-lycopene and (E)-ß-carotene can easily be isomerized to the E-Z conformations, although a decrease in the total carotenoid content can indicate other routes of degradation such as oxidative process. In contrast, there are reports on the increase in total carotenoid concentration in the dry matter of tomato paste, which we have found a high rate of isomerization to (E)-ß-carotene compared to (E)-lycopene (Chanforan et al. 2018).

Georgé et al. (2019) compared the nutritional composition (carotenoids, polyphenols, and vitamin C) of red and yellow tomatoes, both fresh and subjected to thermal treatment as welfas lyophilized. After subjecting to thermal processing, the yellow tomato showed a significant decrease in the content of B-carotene (44%), while the content of -carotene and lycopene did not change in the red tomato. With the freeze-drying process it was found that, in both red and yellow tomatoes, the carotenoids content was significantly lower than fresh tomatoes. B-Carotene decreased 14% in the red fruit and 11% in yellow while the lycopene content decreased 47% in the red tomato. The content of vitamin C increased with the freeze-drying process and decreased with heat processing for both stages (Georgé et al. 2019).

2.4.1 Tomato puree

Tomato puree differs from tomato paste in texture and depth of flavor. Tomato paste is more concentrated and has got a very strong flavor, whereas tomato puree had diluted flavor and is thinner in texture. Tomato puree contains between 11 and 14 percent TSS, and differs from paste only because of the lower concentration.

2.4.2 Shelf Life Stability of Tomato Puree

Tomato is processed in the forms of pulp, paste, juice, ketchup, purce (Hayes et al 2019). A number of studies have used hedonic measurements to determine the end of shelf life for tomato products. However many of these studies did not go long enough to find the end of shelf life.

Food processors store tomato pulp under conditions available in their premises, It has been observed that temperatures varying from as high as 20 to 40^0C, refrigeration (4 to 10^oC) to as low as 20°C are employed for storage purpose. High temperature storage is detrimental to product quality while lower temperature adds cost to the product (Jamil, 2019). No significant differences were found between the flavor of tomato concentrates stored for six months at 4°C and those stored at 21°C for the same period.

Tomato puree could be stored at varying storage conditions for 240 days (8 months) with minimum damage to the product quality at lowest possible cost. It was observed that samples stored at low temperature such as 6^0C and 10^0C remained acceptable after 240 days storage and samples were rejected organleptically at higher temperatures storage at 25^0C (Muhammad et al, 2010).

Quality Problems

- If the tomato paste is too dark, it indicates that it has been overcooked.
- If it is too liquid, the temperature of the hot break is too low.
- A yoghurt taste indicates the presence of lactic acid bacteria, which results from the raw tomato standing for too long before being processed.

All these problems can be overcome with proper technology

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents the methodology that will be adopted for this research approach. The methodology described the specification of procedure for the collection and analysis of data necessary to solve the problem required in the study. Methodology is described as the set of methods systematic approach towards solving a particular problem through data collection.

During the course of obtained information on this research study. Efforts were immensely made to obtain first-hand information and comprehensive data in relation to the significance of personnel development and training in a business. Factors were gathered through two major source of data collection i.e primary and secondary data collection.

3.1 Research Design

Research Design refers to the overall strategy utilized to carry out research that defines a succinct and logical plan to tackle established research question through the collection, interpretation, analysis, and discussion of data.

The research design is an analytical survey. Analytical surveys also referred to as diagnostic studies attempt to describe and explain why certain situations exist. In this approach two or more variables are usually examined to test research hypotheses. The results allow researchers to examine the interrelationships among variables and to draw explanatory inferences.

The research design for this work is essentially the plan, strategy, and structures for investigation cross sectional is used where my questionnaire is distributed once for the survey tool of this study to the various respondents regarding to my number of contact. The research design was an analytical survey.

Analytical surveys also referred to as diagnostic studies attempt to describe and explain why certain situations exist. In this approach two or more variables are usually examined to test research hypotheses.

The results allow researchers to examine the interrelationships among variables and to draw explanatory inferences.

3.2 Study Area

The Study area for the study is the utilization of local tomato in the production of tomato puree.

3.3 Target Population Of The Study

Population "as the means of identifying characteristic which number of the universe have in common and which will identify each unit being a member of a particular group. The population for the study will be sixty two (62)

The population of this study will consist of the selected hoteliers, front office staff ete which consists of both senior and junior staff. Therefore the researcher decided to focus attention on 62 selected respondents.

3.4 Sampling Techniques

The techniques for research this study, shall be carryout in specific area of sample study to cover the particular area of the population on the basis of questionnaire administered for respondent view. Simple random sampling was used to select population elements.

3.5 Sampling Size

The sample size is a reasonable number of selected trait, event or members taken from population as a representative of that population, so the sample for the study will be Sixty Two (62) selected personnel Simple random sampling was used to select population elements.

TARO YAMINE (2019) formula is used to determine the sample size for research TARO (2019) method.

N= NI (1#N(e)

Where n = sample Size

N = total population

E = Error Limit (0.05 on the basis of 95% confident level

1 = Constant

$$1+ N2 N$$

$$Ce$$

$$1 + \frac{62 .}{(0.05)^2}$$

$$1 + (0.0025)^2 (62)$$

$$\frac{62}{1.25}$$

N = 49.6

= 50

3.6 Research Instrument

A Research Instrument is a tool used to collect, measure, and analyze data related to your research interests. These tools are most commonly used in health sciences, social sciences, and education to assess patients, clients, students, teachers, staff, etc.

The instrument for this research work is the use of sensory evaluation form which consists of section A and Section B. the Section A deals with the Bio-data of respondents while the section B deals with the Research Based question on the research topic.

Sensory Evaluation

Sensory evaluation is a scientific discipline that applies principles of experimental design and statistical analysis to the use of human senses (sight, smell, taste, touch and hearing) for the purposes of evaluating consumer products.

In this research study, Affective testing will be utilized. Affective testing also known as consumer testing, is a type of testing that is concerned with obtaining subjective data, or how well products are likely to be accepted.

Sensory evaluations for the utilization of local tomato in the production of tomato puree are done using affective testing through the design of a structured questionnaire. The questionnaire are administered to carefully selected panels of personnel recruited for this type of testing after consumption of the puree.

The questionnaire consists of the following structured Sensory Evaluation Form. Please tick the rating of your choice from Excellent to Poor as shown below:

3.6.1 Measurement of Variables

A property that may have different values for different individuals and for which these values result from measuring, meaning that the values may take on any value within an interval of numbers.

The variable measure in the case of this research work is the use of questionnaire, which was embed in table designing, which consist of row and column

3.7 Data Collection Techniques

Data collection techniques refer to methods used to collect and analyze different forms of data.

Standard data collection techniques include going through documents related to a topic, as well as conducting interviews and observations.

The researcher designed was through the use sensory evaluation by taste, appearance, aroma, colour will be used to collect necessary information from the respondent.

3.8 Data Analysis

Data Analysis is the process of systematically applying statistical and/or logical techniques to describe and illustrate, condense and recap, and evaluate data.

The researcher used the percentage method as a statistical technique to analyze and interpreted the data collected. Tabular format is used to analyze the data which consist of Variable, Frequency and percentage.

3.9 Methodology

Materials and Method of Production of Tomato Puree

Equipment

- Deep Sauce Pan
- Blender or Mixer
- Knife (to cut tomatoes)

Ingredients:

Recipe	**Quantity**
Tomatoes	5 pieces
Water	1 Cup
Preservative	1 table spoon

METHOD

- Choose red, ripe and firm tomatoes, which are not sour. In this recipe, red plum tomatoes are used. Rinse them in running water to remove any debris or dirt.
- Make two 1/3-inch deep cuts perpendicular to each other with knife on each tomato as shown in the picture (cuts should be made on top, not on the side). This will make poeling easier in later steps.
- Fill water in a deep pan or deep pot and bring it to boil over medium fame. When it starts boiling, carefully slide tomatoes in it and boil for 3-minutes.
- Turn off flame. Remove tomatoes from hot water and place them in cold water for 2-minutes. Drain water and transfer to a plate. Peel and remove the skin (start peeling from the cut portion - it come out easily because upper layer turns soft after boiling and loosens the binding with flesh.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

The researcher in this chapter attempts to present the data obtained through administration of sensory evaluation form distributed to the selected testing panel which consist of the selected respondents.

The data obtained are then analyzed on the order of their presentation in the sensory evaluation form. It is to be noted that the researcher present data collected from the sensory evaluation form using tables and analyzed in a visual statistical analysis format.

4.2 Data Presentation and Analysis

In this chapter, data collected using the instrument of data collection were presented and analyzed. The data such presented were based on the responses from the respondents through the use of carefully administered sensory evaluation forms which was completed and returned to the researcher.

Fifty (50) sensory evaluation forms were used as the data collection tool for this research work.

The data are thus present based on questions presenting the respondent's Bio Data and the analysis of the questions that are based on the formulated questions in the sensory evaluation form.

4.3 Analysis of Data

The fifty (50) sensory evaluation forms are thus analyzed as shown below:

TABLE 4.1: SEX OF RESPONDENTS

SEX	NO OF RESPONDNETS	PERCENTAGE
Male	20	40
Female	30	60
Total	50	100%

Source: Researcher's Survey, 2025

Table 4.1 shows above that 20 respondents representing 40% of the total respondents were Male while 30 respondents representing 60% of the total respondents were female. The significance of this result shows that female were the most used respondents for this research.

TABLE 4.2: AGE OF RESPONDENT

SEX	NO OF RESPONDNETS	PERCENTAGE
16-25	32	64
26-45	17	34
46 and Above	1	2
Total	50	100%

Source: Researcher's Survey, 2025

Table 4.2 shows that 32 respondents representing 64% of the total respondents were from the age range of 16-25 while 17 respondents representing 34% of the total respondents were 26-45 years, while 1 respondent representing 2% were 46 years and above. The significance of this result shows that more youths individual are used for this research work.

TABLE 4.3: AGE OF RESPONDENT

MARITAL STATUS	NO OF RESPONDNETS	PERCENTAGE
SINGLE	46	92
MARRIED	4	8
OTHERS	-	-
Total	50	100%

Source: Researcher's Survey, 2025

Table 4.3 shown above that 46 respondents representing 92% of the total respondents were single while 4 respondents representing 8% of the total respondents were married, no respondent were others. The significance of this result shows that more single respondents were used for this research work.

TABLE 4.4: EDUCATIONAL QUALIFICATION OF THE RESPONDENTS

EDUCATIONAL QUALIFICATION	NO OF RESPONDNETS	PERCENTAGE
WAEC	4	8
OND/NCE	28	56
HND/BS.C/BA	18	36
Ph.D	-	-
Total	50	100%

Source: Researcher's Survey, 2025

Table 4.4 shown above that 4 respondents representing 8% were O'level holder while 28 respondents representing 56% of the total respondents were OND/NCE Holder, also, 18 respondents representing 36% were holder of HND/B.Sc/ BA, no respondents were holders of Ph.d. The significance of this result shows that more HND/B.SC/BA holder were used for this research work.

TABLE 4.5: NATIONALITY OF THE RESPONDENTS

NATIONALITY	NO OF RESPONDNETS	PERCENTAGE
NIGERIA	50	100
OTHERS	-	-
Total	50	100%

Source: Researcher's Survey, 2025

Table 4.5 shown above that all the 50 respondents representing 100% are Nigerians,. The significance of this result was all the respondents are Nigerians.

TABLE 4.6: RELIGION OF THE RESPONDENTS

RELIGION	NO OF RESPONDNETS	PERCENTAGE
CHRISTIAN	24	48
MUSLIM	26	52
Total	50	100%

Source: Researcher's Survey, 2025

Table 4.6 shown that 24 respondents representing 48% of the total respondents were Christian while 26 respondents representing 52% of the total respondents

were Muslim, The significance of this result shows that more Muslim respondents are used for this research work.

SECTION B: SENSORY EVALAUTION FORM ANALYSIS AND INTERPRETATION TABLE

4.7: APPEARANCE OF THE TOMATO PUREE USING LOCAL TOMATO

VAIRABLES	NO OF RESPONDNETS	PERCENTAGE
Excellent	37	74
Very Good	11	22
Good	-	-
Fair	2	4
Poor	-	-
TOTAL	50	100%

Source: Researcher's Survey, 2025

From the table 4.7 shown above, 37 respondents representing 74% of the total respondents rated the Appearance of the tomato puree excellent, 11 respondents representing 22% rated the jam as very good, while the remaining 2 respondents representing 4% chooses fair. No respondents choose poor as the appearance of the tomato puree.

TABLE 4.8: TASTE OF THE TOMATO PUREE USING LOCAL TOMATO

VARIABLES	NO OF RESPONSES	PERCENTAGE (%)
Excellent	15	30
Very Good	24	48
Good	7	14
Fair	4	8
Poor	-	-
TOTAL	50	100%

Source: Researcher's Survey, 2025

TABLE 4.8: TASTE OF THE TOMATO PUREE USING LOCAL TOMATO

From the table 4.8 shown above, 15 respondents representing 30% of the total respondents rated the taste of the tomato puree as excellent, 24 respondents

representing 48% rated the jam taste as very good, while 7 respondents representing 14% chooses good, and the remaining 4 respondent representing 8% chooses fair. No respondents choose poor as the taste of the puree.

TABLE 4.9: TEXTURE OF TOMATO PUREE USING LOCAL TOMATO

VARIABLES	NO OF RESPONSES	PERCENTAGE (%)
Excellent	25	50
Very Good	19	38
Good	4	8
Fair	2	4
Poor	-	-
TOTAL	50	100%

Source: Researcher's Survey, 2025

From the table 4.9 shown above, 25 respondents representing 50% rated the jam as excellent, 19 respondents representing 38% rated the recipe texture as very good, 4 respondents representing 8% chooses good, while 2 respondents representing 4% chooses fair. No respondents choose poor as the texture of the puree.

TABLE 4.10: FLAVOUR OF TOMATO PUREE USING LOCAL TOMATO

VARIABLES	NO OF RESPONSES	PERCENTAGE (%)
Excellent	-	-
Very Good	11	22
Good	25	50
Fair	14	28
Poor	-	-
TOTAL	50	100%

Source: Researcher's Survey, 2025

From the table 4.10. shown above, 1 respondents representing 22% of the total respondents rated the flavor of the puree very good, 25 respondents representing 50% rated the recipe taste as good, 14 respondents representing 28% chooses fair. No respondents choose poor as the flavor of the puree.

TABLE 4.11: ACCEPTABILITY OF THE JAM PRODUCED USING PINEAPPLE

VARIABLES	NO OF RESPONSES	PERCENTAGE (%)
Excellent	-	-
Very Good	21	42
Good	23	46
Fair	6	12
Poor	-	-
TOTAL	50	100%

Source: Researcher's Survey, 2025

From the table 4.11 shown above, 21 respondents representing 42% of the total respondents rated the acceptability of the puree very good, 23 respondents representing 46% rated the puree acceptability as good, while 6 respondents representing 12% chooses fair, no respondents choose poor.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The project work discussed clearly on production and uses of local tomato to produce tomato puree. The project also contains origin of tomato with the aim of throwing more light on the benefit of production tomato puree for home use.

Tomato belongs to the salanace as family and it is one of the most important vegetable worldwide. Nigeria ranks as the largest tomato producing nation in the world and has the comparative advantage and potential to lead the world in tomato production.

5.2 Conclusion

In this study people prefer globe tomato than plum tomato, the colour of the final product is reddish in colour. The globe is thicker than the plum tomato so the kwarans prefer the globe tomato.

Also, Tomatoes are one of the most popular agricultural cash crops grown globally because of their dietary benefits for human health. In Nigeria, large-scale commercial farmers contribute nearly 95% of the total annual production of tomatoes, while the limited small-scale farmers contribute the remaining 5%. The industry is not, however, without its challenges. High input costs, fluctuating market prices, a shortage of good quality irrigation water, an unreliable electricity supply, poor post-harvest handling, labour issues and a poor road infrastructure are among the top challenges that need to be addressed.

The reviewed literature proved that the uses of tomato for puree can be improved. The quality-defining factors of fresh tomatoes, such as their colour, freshness and firmness, change during storage and display, and are significantly influenced by the post-harvest conditions. The packaging, for example, is not only considered as a container that ensures hygiene and averts mechanical damage to

the tomatoes, but it is also is a valuable tool that is used to maintain the bio-active constituents and flavour-related
volatiles, and to extend their shelf-life.

The final results of the research was that the domestication of tomato started with the Aztec and Inca cultures where it was used as part of regular diet and its production and consumption grew at the same level as the population did. Nowadays tomato is sold fresh and also processed in several products like soups, pastas, concentrates, juices, and ketchup.

5.3 Recommendations

i. The use of tomato Puree in restaurants, hotel and for catering students is thereby advised to be use because of its numerous nutritional value.
ii. Training workmanship should be open to in individual where they could team the procedure for making this product.
iii. The State and the Federal Government should enable farmers so that more tomatoes can be harvested for puree
iv. It also contains daily nutrient and it is a good source of vitamin A and C also helps in regulation in immune system maintain eye surface linings of eyes and weight gain.

REFERENCES

Akbudak, U. (2018): Assessment on post-harvest losses of tomato (Lycopersicon esculentem Mill.) in selected districts of the East Shewa Zone of Ethiopia using a commodity system analysis methodology. Heliyon 6(4):e03749, 57-60.

Arazuri, T. Anzi, M and Wesley, S (2018): Packaging and storage of tomato puree and paste. Stewart Postharvest Review 3, 1-8.

Batu, U. (2018): Determination of acceptable firmness and colour values of tomatoes. Journal of Food Engineering 61, 471-475.

Bergougnoux, T (2018): Reducing postharvest food losses in developing economies by using a Network of Excellence as an intervention tool. In Proceedings of the IFAMA 2014 Symposium Proceedings' People Feed the World. PP 67-68.

Bergougnoux, T (2019): Food Losses: Developing a Consistent Global Estimation Framework. Journal of food Engineering 70, 465-475.

Bramley, U (2019): Nutrient content of tomatoes and tomato products. Experimental Biology and Medicine 218, 98-100.

Chanforan, U. Chen, Y and Helder, E (2018): Mode of action of plastic film in extending life of lemon and bell pepper fruits by alleviation of water stress. Plant Physiology 73, 87-93.

Cheng, U. Tihait, U and Medlas, U (2019): Physical and socio economical profile of 180 Districts of Oromia Region. Ethiopia: Bureau of Planning and Economic Development of Oromia Regional state, 248-251.

Colle, U (2019): Lycopene content and colour of ripening tomatoes as affected by environmental conditions. Journal of the Science of Food and Agriculture 86, 568-572.

Cortez, A (2019): Effect of potassium magnesium chloride in the fertigation solution as partial source of potassium on growth, yield and quality of greenhouse tomato. Scientia horticulturae 99, 279 pg|288.Shoco.

DPPMDR. (2019): The constituents of tomato fruit the influence of environment, nutrition, and genotype. Critical Reviews in Food Science and Nurition 15, 205-280.

Falohun, U and Kiki, Q (2019): Effect of cooling delay and cold-chain breakage on Santa Clara tomato. Journal of Food, Agriculture and Environment 3, 49-54.

FAOSTAT (2018): Modified atmosphere packaging to extend the shelf life of tomatoes. International Journal of Food Science and Technology 20, 339-349.

FAOSTAT 2019): Genetic improvement of processing tomatoes: A 20 years perspective. Euphytica 110, 85-97.

Freedman, Y. Rasmus, Y and Endo, U (2018): The commercial storage of fruits, vegetables, and florist and nursery stocks. Agriculture Handbook, USDA. 30-40.

Fundación Produce (2019): Increasing food availability by reducing postharvest losses of fresh produce. In "V International Postharvest Symposium 682", pp. 2169-2176.

Gorge, Y. Gerd, M and Adams, H. (2019): Strategies Used for Reducing Postharvest Losses in Fruits and Vegetables. International Journal of Scientific and Engineering Research, 6, 130-137.

Gross, R (2019): Postharvest management of fruit and vegetables in the Asia-Pacific region/ Asian Productivity Organization: Rome (FAO). 70-75.

Guil-Guerrero, R. and Rebolloso-Fuentes, L. (2019): Tomato Fruits Show Wide Phenomic Diversity but Fruit Developmental Genes Show Low Genomic Diversity. PloS one 11, e0152907, 409-456.

Hayes, L. Hades, J and Lang, Y (2019): Quality and nutritional composition of tomato fruit as influenced by certain biochemical and physiological changes. Qualitas Plantarum 24, 85-113.

Heredia, Y a, J and Lang, Y (2019): Storage of fresh tomatoes to determine the level (cac/2) coating and optimum temperature for extended shelf life, Bangkok Asian Institute of Technology, vol 24, pp 679.

Jamil, Q (2019): The firmness of stored tomatoes (cv. Tradiro). 2. Kinetic and near infrared models to describe pectin degrading enzymes and firmness loss. Journal of Food Engineering 77, 585 593. journal of 'ood Science & lechnology 20, 339-349.

Magrama, O.A (2018): "Postharvest. An introduction to the physiology and handling of fruit and vegetables," Granada: 300-310 Mol. Biol., 52: 725-749.

Mourvaki, W. Rasmus, H and Fred, R (2020): Missing food: the case of postharvest grain losses in sub-Saharan Africa: Ethiopia. 200-210.

Muhammad, Y Rasmus, H and Fred, R (2010): Tomato lycopene and its role in human health and chronic diseases. CMAJ., 163: 739-44.

Muller, T (2017): Design and optimization of modified atmosphere packaging of Empire apple fruit following Controlled Atmosphere Storage. Proceeding of the Congress of the Mediterranean Phytopathologicla Union, October 28-Nov. 3, Agadir, Morocco, 60-65 natural oxidative events during storage J. Amer. Qil Chem. Soc., 83: 933-941.

Polivková, L. Polistka, Y and Robert, Y (2018): Quantitative analysis of flavor and other volatiles and for certain constituents of two tomato cultivars during ripening. J. 4m. Soc. Hom Sei, 116: 265 269.

Rabie, L and Humiany, R (2019): Quantitative studies on prigins of fresh tomato aroma volatiles J. Agric. Food Chem., 36: 1247-1250.

Ramakrishnan, T (2019): Fresh tomato aroma volatiles: a quantitative study. J. Agric. Food Chem., 35: 540-544:

Rao, Y and Agarwal, W (2018): The expanding U.S. market for fresh produce, review paper. Center for Agriculture and Rural Development. Available at http://www.agmrc.org/markets /info/expandingusmarketproduce. 50-55

Rodriguez, O. (2018): Quantitative analysis of flavor and other volatiles and for certain constituents of two tomato cultivars during ripening. J. Am. Soc. Hort. Sci., 116: 265-269

Shidfar, T. Singh, Y and Lang, Y (2019): Agricultural engineering in development. Post harvest operations and management of food grains. FAO Agricultural Service Bulletin No. 93. 100-120.

Soule. U (2018): (isterely congated tomato fruit controlled by four quantiative trait local with epistatic interactions. J. Theor. Appl. Genet., 104: 241-247.

Vinha, I (2019): Document Repository, Prevention of post-harvest food losses: Fruits, vegetables and root crops: Atraining manual, Forest Finance Working Paper 17.

Wei, L (2019): Molecular biology of fruit maturation and ripening. Ann. Rev. Plant Physiol. and Plant *Mol. Biol.,* 52:725-749*.*

Willcox, R (2018): Ameloration of chilling injury symptoms on tomato fruits. J. Amer. Soc. Hort. Soi 10: 324.

WPTC (2019): Allelopathy and its implications in agroecosystems. J. Crop. Prod., 1:169-202

Yahia, T. Gerd, K and Lin, G (2018): Pure lycopene from tomato preserves extra virgin olive oil from natural oxidative events during storage J. Amer. Oil Chem. Soc., 83: 933-941.

Zhang, Y, Jahn, K and Kin, R (2019): Quality of pink tomatoes after storage under controlled atmosphere at chilling and non chilling temperatures. J. Food Qual., 19: 363-374.