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# Comparative Study of Antibacterial and Phytochemical Properties of Nigerian Medicinal Plants on *Salmonella bongori and Salmonella enteritidis* Isolated from Poultry Feaces in Owo Local Government. Ondo State, Nigeria

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***Author's contribution***

*The sole author designed, analyzed and interpreted and prepared the manuscript. Author OOT research into the antimicrobial and phytochemical properties of various medicinal plants in Nigerian and Africa and design the materials and methods used in the course of the research work.*

***Article Information***

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## ABSTRACT

Salmonellosis is cause be salmonella species of bacteria namely *Salmonella enteritica* and *Salmonella bongori*. Salmonellosis is a form of food poisoning usually obtained from eating tainted meat, poultry eggs or dairy products. Conventional medicine states there is no real cure for salmonella infection, but alternative medicine may have remedies and treatments available that can reduce or eliminate the majority of symptoms if caught and treated in time. The basic objective of this research work is to determine the antibacterial and phytochemical properties of some Nigerian medicinal plants on *Salmonella species* Isolated from poultry feaces in Owo local Government as a scientific rationale behind the medicinal uses of the plants. The plant were collected from Owo reserved forest along Ute road, Ondo state and authenticated by a botanist in the Department of Biological Sciences, Achievers University, Owo. The test organism were collected from a known poultry in Owo and isolated at the Department of Microbiology, Federal Medical Centre, Owo, Ondo State. Plant extract were prepared for extraction, with four extracting medium and simple distillation method, this precede biochemical test to ascertain its authenticity. Antibacterial and Phytochemical

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assay using the Agar diffusion method were used. *Morindalucida and Piper guineense* were the most active and *Nicotianatabacum* and *Cariaca papaya* were moderately Sensitive to the test organism. Phytochemical screening shows that the plant contains some compounds like Tannin, Phenol, Alkaloid, Flavonoids, Oxalate, Saponin, and Phytate. Minerals present in plant extract (/100 g) arena (Sodium), K (Potassium), C (calcium), Mg (Magnisium), Zn (Zinc), Fe(Iron), Pb (lead), Cu (Copper), Mn (Manganese) and P (Phosporus). The research shows that *Morindalucida, Piper guineense, Nicotianatabacum and Cariaca papaya are potent remedy for* salmonellosis*,* therefore the use of medicinal plant should be encourage and the production of new antibiotic.

*Keywords: Salmonella species (Salmonella bongori and Salmonella enteritidis); antibacterial assay; phytochemical screening; minerals composition; nutrient and anti-nutrient composition.*

## 1. INTRODUCTION

Plants have been used from ancient times to attempt cures for diseases and to relive physical suffering. Ancient peoples all had acquired some knowledge of medicinal plants. Oftentimes these primitive attempts at medicine were based on superstition and speculation. Evil spirits in the body were thought to be the cause of medical problems. They could be driven out of the body through the use of poisonous or disagreeable plant substances that rendered the body a disagreeable habitat. Medicine men or women of a tribe were usually charged with knowledge of such plants. The progress of medicine has often been guided by the earlier observations and beliefs [1] Iwu et al. [2].

Medicinal plants are plants that have a recognized medical use. They range from those used in the production of mainstream pharmaceutical products to plants used in herbal medicine preparations. Herbal medicine is one of the oldest forms of medical treatment in human history and could be considered one of the forerunners of the modern pharmaceutical trade. Plants that have medical uses can be found growing in many settings all over the world [3].

The history of studying and working with medicinal plants is quite long. Many chemists are interested in studying plants that have not been researched before, to identify which compounds in the plants are active and to see how those compounds work. Usually, the goal is to develop a synthetic version of the compound that can be easily produced in a lab and packaged in pharmaceutical preparations. A plant's medicinal value is due to the presence in its tissues of some chemical substance or substances that produce a physiological action on the body. Most important are the alkaloids, compounds of carbon, hydrogen, oxygen and nitrogen. Glycosides, essential oils, fatty oils, resins, mucilage's, tannins and gums are all utilized. Some of these are powerful poisons so that the preparation and administering of them should be entirely supervised by physicians, Osuntokun & Olajubu [4].

Plant-derived compounds of therapeutic value are mostly secondary plant metabolites traditionally used for medicinal purposes. They have a wide activity range, according to the species, the topography and climate of the country of origin, and may contain different categories of active principle Variations in the chemical composition modifies their antimicrobial activity. Some main categories of phytochemicals extracted from medicinal plants are examined to evaluate their pharmacological activity.

## 2. SALMONELLOSIS

Salmonellosis is a disease caused by raw or undercooked food. Infection usually occurs when a person ingests foods that contain a high concentration of the bacteria, similar to a culture medium [5]. SALMONELLA-*Salmonella* is a genus of rod-shaped, Gram-negative, non-spore-forming, predominantly motile enterobacterial with diameters around 0.7 to 1.5 μm, lengths from 2 to 5 μm, and flagella that grade in all directions (i.e., peritrichous). They are chemo-organotrophs, obtaining their energy from oxidation and reduction reactions using organic sources, and are facultative anaerobes. Most species produce hydrogen sulfide, which can readily be detected by growing them on media containing ferrous sulfate, such as TSI. Most isolates exist in two phases: A motile phase I and a non motile phase II. Cultures that are non motile upon primary culture may be switched to the motile phase using a Cragie tube [6,7,8].
However, infants and young children are much more susceptible to infection, easily achieved by ingesting a small number of bacteria. In infants, contamination through inhalation of bacteria-

laden dust is possible. After a short incubation period of a few hours to one day, the bacteria multiply in the intestinal lumen, causing an intestinal inflammation with diarrhea that is often mucopurulent and bloody. In infants, dehydration can cause a state of severe toxicosis. The symptoms are usually mild. Normally, no sepsis occurs, but it can occur exceptionally as a complication in weakened or elderly patients (e.g., Hodgkin's disease). Extra intestinal localizations are possible, especially *Salmonella* meningitis in children, osteitis, etc [9].

Enteritis *Salmonella* (e.g., *Salmonella enteric* subsp. *enterica* serovar *enteritidis*) can cause diarrhea, which usually does not require antibiotic treatment. However, in people at risk such as infants, small children, the elderly, *Salmonella* infections can become very serious, leading to complications. If these are not treated, HIV patients and those with suppressed immunity can become seriously ill. Children with sickle cell anemia who are infected with *Salmonella* may develop osteomyelitis.

The Avr A toxin injected by the type three secretion system of *Salmonella typhimurium* works to inhibit the innate immune system by virtue of its serine/ threonine acetyl-transferase activity, and requires binding to eukaryotic target cell phytic acid (IP6). This leaves the host more susceptible to infection [10,11].

## 2.1 Some Important Constituent of Medicinal Plant are as Follows

Some important constituent of medicinal plant are as follows -Flavonoids, previously called bioflavonoids and included in aromatic compounds, are phenolic structures ubiquitous in photosynthesizing cells and are commonly found in fruit, vegetables, nuts, seeds, stems, flowers, tea, wine, propolis and honey [12]. Alkaloids are heterocyclic nitrogen compounds characterized by different antimicrobial activities. The analysis of the leaf extracts of *Gymnema montanum* and of ethanol extract of *Tabernaemontana catharinensis* root bark revealed an antimicrobial activity in the first case due to an activity depending upon the chemical composition of the extracts and membrane permeability of the microbes, and in the second case linked to indole alkaloids responsible for the observed antibacterial and anti-dermatophytic activity. Terpenes compounds are also referred to as isoprenoids and their derivatives containing additional elements, usually oxygen, are called terpenoids. Diterpenoids, such as sesquiterpenes, isolated from different plants exhibited bactericidal activity against Gram-positive bacteria and inhibited the growth of *M. tuberculosis* [13]. Phenolic compounds are widely distributed in plants, where they protect the plants from microbial infections. They have potential anti-oxidative properties but are also potent anti-infectives. Quinones provide a source of stable free radicals and irreversibly complex with nucleophile amino acids in microbial proteins determining loss of their function [14,15].

### 2.1.1 Brief history of *Morinda lucida*

*Morinda* is a genus of flowering plants in the madder family, Rubiaceae. (United States Department of Agriculture. 2010.) The generic name is derived from the Latin words *morus* "mulberry", from the appearance of the fruits, and *indica*, meaning "of India". *Morindalucida* is a medicinal plant used in many part of Nigeria for the treatment of malaria and other diseases [16].

### 2.1.2 Brief history *Nicotiana tabacum*

*Nicotiana tabacum*, or cultivated tobacco, is a perennial herbaceous plant. It is found only in cultivation, where it is the most commonly grown of all plants in the *Nicotiana* genus, and its leaves are commercially grown in many countries to be processed into tobacco. It grows to heights between 1 to 2 meters. Research is ongoing into its ancestry among wild *Nicotiana* species, but it is believed to be a hybrid of *Nicotiana sylvestris*, *Nicotiana tomentosiformis* and possibly *Nicotiana otophora* [17,18].

### 2.1.3 Brief history of *Carica Papaya*

Papaya is a palm - like, soft - stemmed, evergreen tree, *Carica papaya*, that is native to the tropics of the Americas, but which is now cultivated in tropical and warm, semi-tropical zones around the world. Papaya also is the name for the large, juicy, melon-like, edible fruit of this tree, which has black seeds in the center and typically ranges in color from an amber to a yellow hue [19,20]. The papaya fruit is both delicious and nutritious. It provides several vitamins and minerals in significant amounts, is low in calories, and has an enzyme that is useful in tenderizing meat and for treatment of indigestion [19,20] The succulent fruit with its unique flavor, texture, shape, and color adds to the sensual joy of humans. Beyond these nutritional, commercial, and aesthetic values for

people, the trees and fruits also offer ecological values, providing food and habitat for insects, birds, and other animals [6].

#### 2.1.4 Brief description of *Piper guineense*

Guinea pepper (*Piper guineense*) is a vine native to west Africa, which is used as a substitute for black pepper (*Piper nigrun*).It is a perennial plant that is characterized by heart shaped leave and oval, petiole, alternate, 12 cm long. The inflorescence is a pedicelled flower spike between 3 and 6cm long. Flowers are greenish yellow and arranged in a spiral along the spine. The fruit of Guinea pepper fruit is a drupe mesocarp or fleshy, oval, 5 mm in diameter [21].

## 3. MATERIALS AND METHODS

### 3.1Collection of Plant Sample

Fresh leaves and bark of four (4) selected plants were collected from Owo reserved forest along Ute road, Owo, Ondo state. The plants was authenticated by a botanist in the department of biological sciences, Achievers University, Owo and Adekunle Ajasin University, Akungba Akoko, both in Ondo State, Nigeria. The bark and leaves were washed with distilled water for extraction then stored in air tight container and kept at room temperature until needed [22,23].

### 3.2 Test Organism

The test organisms are *Salmonella bongori and Samonella enteritidis* clinical and environmental strains of *Salmonella* species as well as typed strains used as test organism and were sourced from a known poultry in Owo and Akungba Akoko. The test organism were isolated at the Department of Microbiology, Federal Medical Centre, Owo, Ondo State, store in a bijou bottle slant until it is needed for bioassay.

### 3.3 Collection of Samples from Poultry Farm

Different samples were collected on the 11th of May, 2014 at exactly 7.30 am from a poultry farm in Owo and Akungba Akoko, Ondo State, Nigeria. The samples were collected using swap stick for sample collection from different chicken faeces. Ten samples were collected altogether designated by numbering each swap stick from number one to ten and was inoculated on an already prepared media which includes, Mac-Conkey agar, chocolate agar and DCA. The plates were incubated at 35°C for 24 hours [24].

### 3.4 Biochemical Tests

Biochemical test were carried out in order to further identify the isolates. Identification of microorganisms were based on microscopic appearance and biochemical characteristics as described by [25], the biochemical test involves.

#### 3.5 Gram's Reaction

The plates were read after 24 hrs. On the 12th of May, 2014 at 9.00 am, smears were prepared on slides from each plate, numbering the slides one to ten. Gram- staining processes was carried out on the already prepared smear, Using Crystal violet as a primary stain, gentian violet, alcohol as decolourizer and safranin as the counter stain. The slides were then viewed under microscope with oil immersion Len [25].

| Local name | Common name | Botanical name | Part used |
|---|---|---|---|
| Oruwo | Brimstone tree | *Morinda lucida* | Leaf |
| Taba | Tobacco | *Nicotiana tabacum* | Leaf |
| Ibepe | Pawpaw | *Carica papaya* | Bark |
| Pepe | Guinea pepper | *Piper guineense* | Leaf |

### 3.6 KligerIron Agar Confirmatory Test

From the result gotten from gram's reaction, organisms that are gram negative bacilli were inoculated into already prepared test tubes of kliger iron agar for 24hours at 37°C. Agar colour changes from red to black or yellow. This shows that the organism inoculated is a *Salmonella sp,* further procedure molecular characterization were done to distinguish between the two species of the salmonella into *Salmonella bongori and Samonella enteritidis* [24].

### 3.7 Preparation and Extraction of Plant Materials

The already washed bark and leaves of the different plants were weighed using a specified gram (250 g) into 1000 ml conical flasks labeling each according to the name of each plant and was cold exhausted with (1) sterile distilled water, (2) Absolute ethanol, (3) ethyl acetate [26,23]. This was done for nine (9 days). After nine days each sample was filtered using a What man filter paper. Filtrate was taken to Federal University of Technology, Akure. (FUTA) Ondo State, for simple distillation in order to get the plant extra.

### 3.8 Ethanol, Aqueous and Ethyl Acetate Extraction

Two hundred and fifty grammes of each plant sample were separately soaked in 750 ml of Ethanol Aqueous and Ethyl acetate in 1000 ml conical flask for 9 days. The extract was filtered through Whatman filter paper into different sterile crucible [24].

### 3.9 Procedure of Simple Distillation

Sample was poured in reaction bottle and placed on water bath. Sample was boiled at different temperature depending on the extracting medium used. For ethanol 78°C, Ethyl acetate 55°C and distilled water 105°C. The media used distills out leaving remains of extract and water. The remains was then poured in an open mouth beaker and placed in an hot air oven at 105°C. water dries off leaving the plant extract.

### 3.10 Antimicrobial Assay (Determination of Zones of Inhibition Using Agar Well Diffusion)

Twenty five milliliters of Kliger iron agar was poured into sterile petri dishes (A,B,C,D,E) and allowed to set. Standardized test bacterial culture were inoculated into the sterile Kliger iron agar plate using sterile cotton swab. A sterile cork borer of 6 mm diameter was used to punch wells on the agar on each of the petri dishes. In all three holes were made along the surface of the dish and one in the center. Each hole was labeled representing a particular concentration. The dishes were then filled into the wells with three drop of their respective type of extract according to the labeled format. The central well containing the diluent reagent (DMSO) was used as control. The process was carried out for each extract and the inoculated petri dishes were left for few minutes for extract of diffuse into agar. The plate were incubated at 37°C for 18-24 hours (not don in an inverted position) after which the zone of inhibition (if any) were measured [24].

## 4. PHYTOCHEMICAL SCREENING METHODS

The extracts was analyzed for the presence of Alkaloid, Glycosides, Tannins, Saponins, Anthraquinones, Anthocyanosides, Flavonoids, Reducing sugars, Cyanogenic [27] review and modified by [28] qualitative and quantitative analysis were carried out [10].

### 4.1 Qualitative Method of Analyses

#### 4.1.1 Preliminary test / Preparation test

Plant filtrate were prepared by boiling 20 g of the fresh plant in distilled water. The solution was filtered through a vacuum pump. The filtrate were used for the phytochemical screening for flavonoids, tannins, saponins, alkaloids, reducing sugars, anthraquinones and anthocyanosides.

#### 4.1.2 Test for Alkaloids

About 0.2 gram were warmed with 2% of $H_2SO_4$ for two minutes, it was filtered and few drops of Dragendoff's reagent were added. Orange red precipitate indicate the present of Alkaloids**.**

#### 4.1.3 Test for Tannins

One milliliter of the filtrate were mixed with 2m1 of FeC1, A dark green colour indicated a positive test for the tannins.

#### 4.1.4 Test for Saponins

One milliliter of the plant filtrate were diluted with 2 ml of distilled water; the mixture were vigorously shaken and left to stand for 10 min during which time, the development of foam on the surface of the mixture lasting for more than 10 mm, indicates the presence of saponins.

#### 4.1.5 Test for Anthraquinones

One milliliter of the plant filtrate were shaken with 10ml of benzene; the mixture was filtered and 5 ml of 10% (v/v) ammonia were added, then shaken and observed. A pinkish solution indicates a positive test

#### 4.1.6 Test for Anthocyanosides

One milliliter of the plant filtrate were mixed with 5 m1 of dilute HCI; a pale pink colour indicates the positive test.

#### 4.1.7 Test for Flavonoids

One milliliter of plant filtrate were mixed with 2 m1 of 10% lead acetate; a brownish precipitate indicated a positive test for the phenolic

flavonoids. While for flavonoids, I m1 of the plant filtrate were mixed with 2m1 of dilute Na OH; a golden yellow colour indicated the presence of flavonoids.

**4.1.8 Test for Reducing Sugars**

One milliliter of the plant filtrate was mixed with Fehling A and Fehling B separately; a brown colour with Fehling B and a green colour with Fehling A indicate the presence of reducing sugars.

**4.1.9 Test for Cyanogenicglucosides**

This was carried out subjecting 0.5 g of the extract 10 ml sterile water filtering and adding sodium picrate to the filtrate and heated to boil.

**4.1.10 Test for Cardiac glucosides**

Legal test and the killer-kiliani was adopted, 0.5 g of the extract were added to 2 ml of acetic anhydrate plus $H_2S0_4$.

**4.1.11 Quantitative Method of Analyses**

*4.1.11.1 Saponins*

About 20 grams each of dried plant samples were ground and, put into a conical flask after which 100 ml of 20% aqueous ethanol were added. The mixture were heated using a hot water bath. At about 55°C, for 4 hour with continuous stirring, after which the mixture were filtered and the residue re-extracted with a further 200 ml of 20% ethanol. The combined extracts were reduced to 40 ml over a water bath at about 90°C. The concentrate was transferred into a 250 ml separatory funnel and 20 rnl of diethyl ether were added nd then shaken vigorously. The aqueous layer were recvered while the ether layer was discarded. The purification process was repeated three times. 60 rnl of n-butanol were added. The combined n-butanol extracts were washed twice with 10 m1 of 5% aqueous sodium chloride. The remaining solutionwere heated in a water bath. After evaporation, the samples were dried in the oven to a constant weight; the saponin content was calculated as percentage of the starting material.

*4.1.11.2 Flavonoids*

About 10 g of the plant sample were extracted repeatedly with 100 ml of 80% aqueous methanol, at room temperature. The whole solution were filtered through What man filter paper No 42. The filtrate were later transferred into a crucible and evaporated into dryness over a water bath; the dry content were weighed to a constant weigh.

*4.1.11.3 Cardiac glucosides*

Legal test and the killer-kilianiwwas adopted, 0.5 g of the extract were added to 2 ml of acetic anhydrate plus $H_2S0_4$.

*4.1.11.4 Tannins*

About 500 mg of the plant sample were weighed into a 50 ml plastic bottle. 50 ml of distilled water was added and shaken for 1 hour on a mechanical shaker. This was filtered into a 50 ml volumetric flask and made up to the marked level. Then, 5 ml of the filtrate was transferred into a test tube and mixed with 2 ml of 0.1 M FeCl in 0.1 M Hcl and 0.008 M potassium ferrocyanide. The absorbance were measured at 120 nm within 10 minutes. The tannins content was calculated using a standard curve of extract.

*4.1.11.5 Alkaloids*

Five grams of the plant sample were weighed into a 250 ml beaker and 200 ml of 10% acetic acid in ethanol was then be added, the reaction mixture were covered and allowed to stand for 4 hour. This were filtered and the extract will be concentrated on a water bath to one-quarter of the original volume. Concentrated ammonium hydroxide was added drop-wise to the extract until the precipitation is complete. The whole solution were allowed to settle and the precipitate was collected, washed with dilute ammonium hydroxide and then filtered; the residue being the alkaloid, which was dried and weighed to a constant mass.

*4.1.11.6 Phlobatannins*

About 0.5 grams of each plant extracts were dissolved in distilled water and filtered. The filtrate were boiled in 2% HCl, red precipitate show the present of phlobatannins.

## 5. RESULTS

The result obtained during the course of the research work were represented Tables 1,2,3,4,5,6,7 which is as follows.

## 6. DISCUSSION

The result presented in this study showed that the tested plant extract contained antibacterial activities. The result varies in their activities with different phytochemical present. *Salmonella bongori* is most susceptible in aqueous extract while *Salmonella enteritidis* is less susceptible to aqueous extract. *Salmonella enteritidis* is most susceptible to ethanol and ethyl acetate extract while *S. bongori* is less susceptible, as revealed by [24,25].

It was observed that ethanol extracts showed a high level of anti-bacterial activity, then aqueous extract and ethyl acetate extract shows less antibacterial activity. This might be due to the fact the ethanol is able to extract out the component of the plants than the other two extracting medium [24].

In this study the antibacterial activity of ethanol, ethyl acetate and aqueous extracts bark and leaf of *C. papaya, Nicotiana tabacum, Morinda lucida, Piper guineense* were evaluated and the result indicates that three namely*, Nicotiana tobacum, Morinda lucida, Piper guineense*has higher activity against *Salmonella* strains from poultry birds which includes *Salmonella bongori and Salmonella enteritidis* tested while *C. papaya* is less active against *Salmonella* strains from poultry birds. The three plants in the treatment of *salmonella*are acting as potential agent for treatment of *salmonella* infection from poultry birds from natural plant source [29].

The phytochemical screenings of *Carica papaya, Morindalucida,* were observed in this study shows that tannin, phenol, alkaloid, saponin, phibatanin, steroid, and flavonoid were present. This result shows that these plants are edible and easily digested by the system without causing harm to the system. Tanin were found to be useful to human physiological activities such as phagocyte cell, host mediated activity and a wide range of anti-effective action. One of the molecular action is to complete protein synthesis to specific forces such as hydrogen bonding and hydrophobic effect [26,30].

**Table 1. Antibacterial effect of aqueous extract at 20mg/ml,40mg/ml, and 60mg/ml concentrations**

| Extract | *Salmonella enteritidis* | | | *Salmonella bongori* | | |
|---|---|---|---|---|---|---|
| | 20 mg/ml | 40 mg/ml | 60 mg/ml | 20 mg/ml | 40 mg/ml | 60 mg/ml |
| *Carica papaya* | 9.0 | 11.0 | 12.0 | 8.0 | 10.0 | 12.0 |
| *Morindalucida* | 13.0 | 13.0 | 14.0 | 6.0 | 10.0 | 12.0 |
| *Nicotianatabacum* | 7.0 | 10.0 | 11.0 | 10.0 | 12.0 | 15.0 |
| *Piper guineense* | 9.0 | 12.0 | 13.0 | 13.0 | 14.0 | 16.0 |

*Unit of Zone of inhibition= mm*

**Table 2.Antibacterial effect of ethanol extract at 20mg/ml, 40mg/ml, and 60mg/ml concentrations**

| Extract | *Salmonella enteritidis* | | | *Salmonella bongori* | | |
|---|---|---|---|---|---|---|
| | 20 mg/ml | 40 mg/ml | 60 mg/ml | 20 mg/ml | 40 mg/ml | 60 mg/ml |
| *Carica papaya* | 2.0 | 3.0 | 4.0 | 7.0 | 9.0 | 10.0 |
| *Morindalucida* | 12.0 | 14.0 | 16.0 | 10.0 | 12.0 | 15.0 |
| *Nicotianatabacum* | 4.0 | 10.0 | 14.0 | 10.0 | 14.0 | 18.0 |
| *Piper guineense* | 2.0 | 5.0 | 6.0 | 3.0 | 5.0 | 9.0 |

*Unit of Zone of inhibition=mm*

**Table 3. Antibacterial effect of ethyl acetate extract at 20mg/ml, 40mg/ml, and 60mg/ml concentrations**

| Extract | *Salmonella enteritidis* | | | *Salmonella bongori* | | |
|---|---|---|---|---|---|---|
| | 20 mg/ml | 40 mg/ml | 60 mg/ml | 20 mg/ml | 40 mg/ml | 60 mg/ml |
| *Carica papaya* | 11.0 | 12.0 | 16.0 | 5.0 | 5.0 | 7.0 |
| *Morindalucida* | 11.0 | 14.0 | 15.0 | 4.0 | 8.0 | 10.0 |
| *Nicotianatabacum* | 15.0 | 15.0 | 21.0 | 6.0 | 7.0 | 8.0 |
| *Piper guineense* | 10.0 | 13.0 | 15.0 | 4.0 | 5.0 | 6.0 |

*Unit of Zone of inhibition= mm*

**Table 4. Phytochemical screening of the medicinal plant samples**

| Plant sample | Cardiac glucoside | Tannins | Phenol | Alkaloid | Saponin | Philobatain | Steroid | Flavoniods |
|---|---|---|---|---|---|---|---|---|
| *Carica papaya* | +ve | +ve | +ve | +ve | +ve | +ve | +ve | +ve |
| *Nicotianatabacum* | ±ve | +ve | +ve | +ve | +ve | +ve | -ve | +ve |
| *Morindalucida* | +ve | +ve | +ve | +ve | +ve | +ve | -ve | +ve |
| *Piper guineense* | +ve | +ve | +ve | +ve | +ve | +ve | +ve | -ve |

*Keys: +ve = Presence of constituents, -ve = Absence of constituents , ±ve = Slightly present*

**Table 5. Minerals composition present in plant extracts in mg/100g**

| S/N | Na | K | Ca | Mg | Zn | Fe | Pb | Cu | Mn | P |
|---|---|---|---|---|---|---|---|---|---|---|
| *Carica papaya* | 24.73 | 30.11 | 32.45 | 26.05 | 28.04 | 6.88 | ND | 0.01 | 6.39 | 27.51 |
| *Nicotianatabacum* | 15.47 | 32.65 | 18.50 | 33.47 | 40.25 | 3.54 | ND | 0.01 | 5.45 | 79.85 |
| *Morindalucida* | 11.68 | 19.54 | 12.75 | 22.64 | 20.50 | 7.48 | ND | 0.01 | 17.33 | 103.21 |
| *Piper guineense* | 20.00 | 26.14 | 31.46 | 22.05 | 25.03 | 5.77 | ND | 0.01 | 6.20 | 25.12 |

*Key: ND= Not detected*

**Table 6. Anti-Nutrient present in plants extract result in percentage (%)**

| S/N | Samples | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| parameters | ***Carica papaya* 1a** | ***Carica papaya* 1b** | ***Nicotiana tabacum* 2a** | ***Nicotiana tabacum* 2b** | ***Morinda lucida* 3a** | ***Morinda lucida* 3b** | ***Piper guineense* 4a** | ***Piper guineense* 4b** |
| Tannin (%) | 6.66 | 6.60 | 4.87 | 4.85 | 4.30 | 4.27 | 0.31 | 0.29 |
| Phenol (%) | 3.75 | 4.00 | 5.45 | 5.50 | 5.33 | 4.87 | 0.13 | 0.12 |
| Phytate (%) | 14.59 | 15.20 | 19.77 | 20.10 | 20.59 | 21.10 | 1.24 | 1.20 |
| Oxalate (%) | 1.45 | 1.40 | 4.14 | 4.21 | 4.50 | 4.60 | 0.38 | 0.20 |
| Saponin (%) | 6.70 | 7.02 | 12.85 | 12.90 | 10.25 | 10.21 | 9.16 | 9.13 |
| Flavonoids (%) | 3.50 | 3.60 | 10.16 | 10.20 | 7.22 | 6.98 | 7.70 | 7.00 |
| Alkaloids (%) | 0.25 | 0.22 | 2.56 | 3.00 | 6.34 | 6.37 | 3.11 | 3.09 |

*Note: Sample 1a&b-representsCarica papaya, Sample 2a&b-representsNicotiana tabacum Sample.3a&b-representsMorinda lucida.Sample 4a&b-representsPiper guineense*

**Table 7. Nutrient composition of plant extract inpercentage(%)**

| S/N | % Ash | % MC | % CP | % Fat | % Fibre | % CHO |
|---|---|---|---|---|---|---|
| Sample *Carica papaya*1a | 12.67 | 9.38 | 13.33 | 6.48 | 11.45 | 46.69 |
| Sample *Carica papaya*1b | 12.69 | 9.40 | 12.87 | 6.44 | 11.43 | 47.17 |
| Sample *Nicotiana tabacum*2a | 9.35 | 3.78 | 14.68 | 7.25 | 4.37 | 60.57 |
| Sample *Nicotiana tabacum*2b | 9.37 | 3.74 | 14.72 | 6.82 | 4.42 | 60.93 |
| Sample *Morinda lucida*3a | 8.72 | 7.33 | 16.25 | 5.37 | 8.59 | 53.74 |
| Sample *Morinda lucida*3b | 8.75 | 7.35 | 16.19 | 5.42 | 8.55 | 53.74 |
| Sample *Piper guineense*4a | 10.56 | 9.12 | 14.45 | 6.59 | 10.33 | 42.59 |
| Sample *Piper guineense*4b | 10.12 | 9.00 | 12.01 | 6.55 | 10.12 | 41.17 |

***Note:*** *Sample 1a&b- represents Carica papaya, Sample 2a&b-representsNicotiana tabacum Sample.3a&b-represent Morinda lucidaSample4a&b- represent Piper guineense,* ***Keys:*** *MC=Moisture content ,CP=Crude protein.CHO=Carbohydrate*

The presence of phytochemical in qualitatively and quantitatively, signified the important role which they plays in the plants and in human body. The simplest of phenols derived from benzene is also known as phenol and has the chemical formula $C_6H_5OH$.

The presence of phenols is considered to be potentially toxic to the growth and development of pathogens [31] Flavonoids are potent water-soluble super antioxidants and free radical scavengers which prevent oxidative cell damage, have strong anti-cancer activity and protects against all stage of carcinogens.

Flavonoids in the body are known to reduce the risk of heart diseases.

Saponin are glycosides of both triterpenes and steroids that are characterized by their bitter or astringent taste, foaming property, haemolytic effect on red blood cells and cholesterol binding properties [27,32].

Both flavonoids, phenols, saponin and alkaloids were found in *Carica papaya, Nicotiana tabacum, Morindalucida and. The absorbance in phytochemical were not measured during the course of this research work.*

The presence of phytochemical activity also shows that it can help the body to neutralize both gram-positive and gram –negative bacteria which can be found in abundance in *Morinda lucida, Carica papaya, Nicotiana tobacum, and Piper guineense* that shows abundant phytochemical analysis and antibacterial activities.

The nutrient proximate composition of *Morinda lucida, Carica papaya, Nicotiana tobacum, and Piper guineense,* shows that ash, moisture content, crude protein, fat, carbohydrate, and fibre were present in *Morinda lucida, Carica papaya, Nicotiana tobacum, and Piper guineense* which shows that the plant are edible.

The minerals composition *Morinda lucida, Carica papaya, N. tobacum, and Piper guineense* in Table 7 shows that Na, K, Ca, Mg, and Zn are present in *Morinda lucida, Carica papaya, N. tobacum, and Piper guineense* in large quantity and Fe, Cu, and Mn in lesser quantity while Pb is present in none of the plant. Minerals in plants are essential for growth as some serves as protein building block. There are trace and major minerals in plant. The amount of major and trace minerals the body needs is small, but the importance of these nutrients is huge. Humans needs these minerals to maintain health, they transport life-giving oxygen to the body; aid in assimilation of other nutrient; form building blocks such as amino acids, hormones and proteins; Basically, the entire body including your hair, nails, bones, blood and nerve relies on major and trace minerals for it proper function [16].

## 7. CONCLUSION

The findings from the research indicates that, *Carica papaya, Nicotiana tabacum, Morinda lucida, and Piper guineense* are effective in the treatment of diseases caused by *Salmonella.*This can be used in the production of more antibiotics in Nigeria, and it also ensures that the use of local herbs or medicinal plant in general should be encourage by health practitioners and government agencies.

## COMPETING INTERESTS

Author has declared that no competing interests exist.

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