Evaluation of Bioactive Compounds and Antimicrobial Potency of *Persea americana* leaf extracts against specific Bacteria

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Abstract: - Medicinal plants has gained a lot of interest in search of plants with a strong antimicrobial compounds that has the ability to cure diseases caused by specific organisms. This is due to the resistance of these organisms to some antibiotics of importance thereby rendering the drugs ineffective against diseases. The aim and objective of this research is therefore to evaluate the antimicrobial potency and bioactive compounds of *Persea americana* leaf extract against specific bacteria that had previously been identified in the laboratory. Different solvents were used such as ethanol and sterile distilled water to extract the bioactive compounds of the plants and it showed a high level of potency against the isolates. The concentrations of the extracts used for the determination of zones of inhibition were 250µg/ml, 125µg/ml and 62.5µg/ml. The largest zone of inhibition was recorded against *Salmonella typhi* (14.00mm) while *Escherichia coli* had the lowest zone of inhibition (8.00mm) for plants extract using ethanol. *Salmonella typhi* had the largest zone of inhibition (16.00mm) while *Escherichia coli* had the lowest zone of inhibition (6.0 mm) when the plant was extracted using sterile distilled water. Phytochemical analysis of the extract revealed that both ethanolic and aqueous extract are rich in saponins, tannins, flavonoids, alkaloids and steroids. Conclusively, *P. americana* can be utilized as an effective antibiotic substitute for the treatment of infections caused by *Salmonella typhi* and *Escherichia coli*. This is as a result of its demonstrated antibacterial activity.

Key-Words: - Antimicrobial, Phytochemical, Avocado, Clinical isolates, Medicinal, infections

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1 Introduction

Most of the potential for using higher plants to make novel drugs remains untapped. For most of the world, plants are the only source of medications because most people in developing nations get their primary medical care from medicinal plants. (Adegoke and Adebayo, 2009). The worldwide pursuit of strong antimicrobial compounds to fight resistant microorganisms that have been making many traditional medications ineffective in treating infections has led to a growing interest in medicinal plants. The most unusual source of pharmaceuticals is plants. (Latha *et al.,* 2006). The use of medicinal plants as an alternative to conventional antibiotics for the treatment, management, and prevention of infectious diseases is becoming more and more popular throughout the world. (Akpomie *et al*., 2021). Furthermore, because natural extracts with pharmacological action have few side effects and therapeutic promise for treating a variety of disorders, their use has gained a lot of attention (Akwam *et al*., 2022).

Avocado peas come in 150 kinds, one of which being *Persea americana* (Lauraceae) (Pacific Health, 2005). The tree is commonly planted in tropical and subtropical countries; it may reach a height of around 80 feet and has leathery, evergreen leaves. Unisexual blossoms are uncommon. In ethnomedicine, *Persea americana* seeds are used for a variety of purposes, such as treating intestinal parasites, diarrhea, dysentery, toothaches, and skin conditions (Pamplora and Roger, 1999). It has been reported that *P. americana* leaves contain analgesic and anti-inflammatory properties. (Adeyemi *et al*., 2002).

Traditional methods of treating illnesses involved the use of plant concoctions, either in single form or in mixes, prior to scientists making progress in their study into medications that heal human infections. The main benefit is that plants are still the most affordable and efficient alternative source of medication. Many millennia have passed since the first recorded uses of medicinal plants to treat ailments. It is an ancient form of art. (Latha *et al.,* 2006). According to Bibitha *et al*., (2011) due to the

pharmacological qualities, natural plants are frequently used locally in Asia, Latin America, and Africa as basic health remedies. Herbs were first used in the manufacturing of pharmaceuticals and the pharmacological treatment of illnesses (Taylor *et al.*, 2011). Many plants are eaten without fully understanding their precise chemical makeup or health benefits, despite the fact that their use has been passed down through multiple ancestral generations who most likely learned from experience how helpful particular plant food ingredients are (Coe, 2005). Additionally, avocado leaves (*Persea americana* Mill.) have long been utilized as an antihypertensive (Dwi, 2023). It is therefore very important to investigate the phytochemical constituents and antimicrobial effect of avocado leaf against clinical isolates.

2 Materials and Methods

2.1 Collection of sample and preparation

Persea americana fresh leaves were collected from the Federal Polytechnic Ado Metropolis in Ekiti State. The leaves were harvested from the trees weighing a total of 50g. It was thereafter washed with sterile distilled water and air dried until the leaves becomes brittle. The dry leaves were ground into powder with the use of a mill. It was stored in a transparent air-tight container, labeled and preserved at room temperature.

2.2 Isolates

The following bacteria served as test organisms during the course of this work: *Escherichia coli* and *Salmonella typhi*. The isolates were obtained from the Federal Medical Centre Laboratory Ido, Ekiti-State, Nigeria.

2.3 Phytochemical screening of Avocado leaf extract

A preliminary phytochemical analysis was performed to identify the bioactive components found in the leaf extract (Trease, 1989).

2.4 Preparation of Plant extract

After carefully weighing two grams (2g) of extract into a 250 mL conical flask, 50 mL of distilled water was added. It was combined, sealed with a rubber band, and heated to 37^0C degrees Celsius for two hours before being taken out to cool. Whattman filter paper No. 1 was used to filter the content, and the filtrate was saved for analysis.

2.5 Media preparation

Nutrient agar was prepared in a conical flask, 2.8 g of agar powder were suspended in 100 ml of distilled water, shaken rapidly to dissolve, autoclaved for 15 minutes at 121°C, cooled to 47°C, and then transferred into sterile petri dishes.The medium was then allowed to solidify (Cheesbrough, 2003).

In order to prepare MacConkey agar, a conical flask was filled with 4.8 g of agar powder and 100 ml of sterile distilled water. The flask was shaken and corked, then let to soak for around 10 minutes. It was autoclaved for fifteen minutes at 121°C. The media was cooled to 47^0C and poured into sterile plates (Cheesbrough, 2003).

2.6 Antimicrobial Analysis

The Potency of the extracts were determined using agar well diffusion method. Sterile cork borer was used to create six wells on the media used. Following that, 100 µl of the plant extracts at a concentration of 1 mg/ml were added to wells and given five minutes to diffuse. As a control, 1 mg/ml of tetracycline was utilized. The petri dishes were incubated for 24hours at 37°C (Igbinosa *et al*., 2009). Zones of inhibition were measured and recorded. The mean ± standard deviation represents the experiment's results, which were conducted in triplicate.

3 Results and Discussion

The phytochemical screening results of *Persea americana* leaf are displayed in Table 1, wherein the presence of tannins, saponins, flavonoids, alkaloids, terpenoids, anthraquinines, glycosides, and cardiac glycosides was found. The plant's antibacterial effect may be attributed to these physiologically active phytochemicals. These secondary metabolites have different ways by which they carry out their antibacterial actions. According to Shimada (2006), tannins have the ability to form permanent compounds with proline-rich proteins, which prevents cells from synthesizing new proteins. (Parekh and Chanda, 2007). Herbs has been used in the treatment of Intestinal disorders such as diarrhea and dysentery and tannins is the main components. Alkaloid is another secondary metabolite in the leave extract *P. americana* which contain analgesic effects (Sutradhar, 2007) and have been clinically explored. Alkaloids are well known for their antibacterial

properties, which are particularly effective against gram-negative bacteria. (Cushnie *et al*., 2014). Flavonoids and saponins are other secondary metabolites which are majorly present in *P. americana* whose antimicrobial activities have been well documented (Hodek *et al*., 2002).

All of the extracts showed a considerable inhibition against the test microorganisms, as shown in Tables 2 and 3. The highest zone of inhibition was seen in ethanolic extract. 250µg/ml, 125µg/ml and 62.5µg/ml concentration variations were used. The highest zone of inhibition was observed on *S. typhi* (16.00mm) at 125 µg/ml and the lowest was seen against *E coli* (6.00mm) at 62.5 µg/ml when the plant was extracted using ethanol. However, when the plants were extracted using sterile distilled water (aqueous), *S. typhi* had the largest zone of inhibition (14.00mm) at 250 µg/ml while *E coli* was inhibited at 8.00mm at 125 µg/ml. The bioactive compounds determined were alkaloids, flavonoids, and phenols which can enhance the health of the consumers (Ogunlade *et al*, 2019).

Table 1. Bioactive compound of aqueous extract and ethanolic extract of Avocado leaf

Phytochemicals	**Aqueous extract**	**Ethanolic extract**
Saponins	++	+
Tanins	+	+
Flavoniods	++	+
Alkaloids	+++	++
Steroids	++	+
Terpenoids	++	+
Anthraquinone	+	.
Glycosides	++	+
Cardiac glycosides	+	.

Key: +++ means highly present, ++ means moderately present, + means Present, - means absent

Table 2. Antimicrobial potency of extracts from *Persea americana* leaves at varying concentrations (Ethanolic extract)

Zone of inhibition (mm)

Microoganisms	**250 (µg/ml)**	**125 (µg/ml)**	**62.5 (µg/ml)**
Salmonella typhi	14	16	9
Escherichia coli	10	12	6

Table 3. Antimicrobial potency of *Persea americana* leaves extracts at different concentrations (Aqueous extract)

Zone of inhibition (mm)

Microoganisms	**250 (µg/ml)**	**125 (µg/ml)**	**62.5 (µg/ml)**
Salmonella typhi	14	11	11
Escherichia coli	10	8	10

4 Conclusion

Conclusively, Diseases caused by *Escherichia coli* and *Salmonella typhi* can be treated with the extracts from Avocado leafs based on findings from this study. This is due to the potency of the Antimicrobial agents it possesses.

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The author has no conflict of interest to declare that is relevant to the content of this article.