**ABUBAKAR TAFAWA BALEWA UNIVERSITY**

P.M.B 0248 BAUCHI STATE NIGERIA



**EVALUATION OF ANTIDIARRHEAL ACTIVITY OF THE ROOT BARK OF**

Tamaridus indica

**BY**

**OKONKWO, STANLEY CHUKWUEBUKA**

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**SUPERVISOR: PROF. H.M ADAMU**

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**ABSTRACT**

**CHAPTER ONE**

**1.0 INTRODUCTION**

**1.1 Background of the study**

**1.2 Statement of the problem**

**1.3 Significance of the study**

**1.4 Justification of the study**

**1.5 Aim and Objectives**

**1.5.1 Aim of the study**

**1.5.2 Objective of the study**

**CHAPTER TWO**

**2.1 Medicinal Plants**

Medicinal plants have been identified and used throughout human history (Lichterman, 2004). The use of medicinal plants to treat diseases is almost universal amongst non-industrialized societies and is often more affordable than purchasing expensive conventional drugs (Fabricant and Farnsworth, 2001). The world Health Organization (WHO) estimates that 80% of the world population especially Asian and African countries use herbal medicine for some aspect of primary health care (<http://www.traffic.org/medicinalplants>, 30th march 2014). Over 120 active compounds currently isolated from the higher plants are widely used in modern medicine and 80% of these show a positive correlation between their modern day therapeutic use and the traditional use of the plants from which they are derived (Fabricant and Farnsworth, 2001).

**2.1.1 *Tamarindus indica***

**2.2 Test microorganisms**

**2.2.1 *Escherichia coli***

**2.2.2 *Salmonella typhi***

**2.2.3 *Staphylococcus aureus***

**2.3 Phytochemicals in medicinal plants**

Secondary plant metabolites (Phytochemicals) have been extensively investigated as a source of medicinal agents (Krishnaraju, 2005). Plants can synthesize and accumulate a great variety of phytochemicals in their cells including saponins, tannins, flavonoids, cyanogenic, phenolic compounds, lignins, lignans, alkaloids and glycosides (Okwu, 2004). Plants also have a great potency of antimicrobial activity due to the presence of phenolic compounds and essential oils (Aboaba and Efuwape, 2001). Medicinal plants have been known to produce an array of phytochemicals with recognized antibacterial activity belonging to chemical structural classes: phenolics, terpenoids, alkaloids, lectins, polypeptides, and polyacetylenes but the most bioactive constituents are alkaloids, tannins, flavonoids, and phenolic compounds (Hill, 1995). The screening of plant extracts and plant products for antimicrobial activity has shown that higher plants represent a potential source of novel antibiotic prototypes (Afolayan, 2003). Numerous studies have identified compounds within herbal plants that are effective antibiotics (Afolayan, 2003). Some of the commonly used traditional remedies have already produced compounds that are effective against antibiotic-resistant strains of bacteria (Kone *et al., 2004*).

**2.3.1 Tannins**

Tannin is astringeny vegetable product found in a wide range of plants parts ranging from the barks, roots, fruits, leaves, galls and roots (Ramakrshnan, 2006). They occur naturally In plants and are water soluble phenolic compounds of the higher molecular weight of about 500 – 3000 containing phenolic

Hydroxyl groups that make them to effectively cross-link with proteins and other macromolecules (Ramkrishnan, 2006).

Tannins are generally found in plants and they are thought to function as chemical defenses against pathogens and herbivores (Gedir *et al., 2005*). They have been commercially used primarily in the preservation of leather, making glue stains and mordant (Kanth *et al., 2009*). It has also been used in the vegetable industry in different concentration in picking process to provide protection against bacteria, mold, and yeasts (Andrade *et al., 2005*). Antimicrobial activity of tannins has been tested in various fields of medicine providing positive results such as antioxidant activities, anticarcinogenic activities and antimutagenic properties (Lopes *et al., 1999*). Tannins have been used in inhibiting the growth of many fungi, yeasts, bacteria and viruses (Chung *et al.,* 1998). Studies carried out have shown that tannins such as catechin and pyrogallol found in vegetable tannins have been found to be toxic to microorganisms (Cowan, 1999). Tannins have been found not only effective against pathogenic microbes but also have a significant value as a cytotoxic and an antitumor agent (Josh *et al.,* 2013).

**2.3.2 Flavonoids**

Flavonoids or bioflavonoids are secondary metabolites of plants that chemically have a general structure of 15 carbon skeleton consisting of two phenyl rings and a heterocyclic ring (Mc Naught, 1997). There are over 500 groups of flavonoids that have been characterized from various plants according to their chemical structure (Ververidis *et al.,* 2007). They are usually subdivided into anthoxanthins, flavanones, flavanols, flavans, and anthocyanidin (Zhao *et al.,* 2012). In plants they are responsible for floral pigmentation, ultraviolet ray’s filtration in higher plants and symbiotic nitrogen fixation (Galoetti *et al.,* 2008). They are also known to have inhibitory activities against organisms that cause plant diseases for example *Fusarium oxysporum* (Galoetti *et al.,* 2008). Flavonoids have been known to posses antimicrobial activity against bacterial, fungal and viral microorganisms (Cowan, 1999). They are usually known for their antimicrobial activity of inhibiting the synthesis of the nucleic acids, tampering with the integrity of the cytoplasmic membrane function and the energy metabolism process (Cushnie and Lamb, 2005). Flavonoids from some medicinal plants have been found to inhibit the synthesis of the nucleic acids, cause permeability of the inner bacterial membrane and a dissipation of the membrane potential of Gram negative and Gram positive bacteria (Cushnie and Lamb, 2005). Some of the bioactive components have been isolated from flavonoids have been found to contain antifungal, antibacterial and insecticidal activities (Abdel *et al., 2013*). Previous studies carried out have shown that when mixed with antibiotics they have synergistic activity and suppress many pathogenic microorganisms in numerous in vitro and in vivo studies (Cushnie and Lamb, 2011; Manner et al., 2013). Additional in vivo studies have shown that flavonoids can be used as pharmaceutical drugs for bacterial infections or through the dietary intake to offer protection against infection (Zamora *et al.,* 2012).

**2.3.3 Alkaloids**

They are a group of naturally occurring compounds that contain nitrogen and can be neutral or have weakly acidic properties (Mc Naught, 1997). They may also sometimes contain oxygen, Sulphur, more rarely other elements such as chlorine, bromine, and phosphorus (Schardl *et al.,* 2007). They are mainly secondary metabolites of plants but can also be produced by a variety of organisms including bacteria, fungi, and animals (Kittakoop *et al., 2014*). They dissolve in water poorly but readily dissolve in organic solvents (Shi *et al.,* 2014). They are divided into five major groups namely: true alkaloids (contain nitrogen in heterocyclic and originate from amino acids), proto alkaloids, polyamine alkaloids, peptide and cyclopeptides alkaloids and pseudoalkaloids (Faulkner *et al.,* 2006). They have a wide range of pharmacological activities such as antiasthma, antimalarial, anticancer, cholinomimetic, vasodilatory, antiamyhyrithic, analgesic, antibacterial and

**2.3.4 Saponins**

**2.4 Current trend in Phytochemistry and Medicinal Plant**

**CHAPTER THREE**

**3.0 MATERIAL AND METHODS**

**3.1.1 Equipment / instruments**

**3.1.2 Reagents and solvents**

**3.2 Sample collection**

**3.3 Methods**

**3.3.1 Collection of Plant and identification of Plant meterial**

**3.3.2 Preparation of plant extract**

**3.3.2.1 Qualitative phytochemical analysis**

**3.3.2.2 Tannins**

**3.3.2.3 Flavonoids**

**3.3.2.4 Alkaloids**

**3.3.2.5 Saponins**

**3.3.2.6 Phenols**

**3.3.3 Microorganisms**

**3.3.4 Analysis of antidiarrheal activity**

**3.3.4.1 Preparation of sample extract for microbiological assay**

**3.3.4.2 Disc diffusion technique**

**3.3.4.3 Determination of Minimum Inhibitory Concentration (MIC)**

**3.3.4.4 Determination of Minimum Bactericidal Concentration (MBC)**

**CHAPTER FOUR**

**4.0 Expected Result and Conclusion**

At the end of this research work, the phytochemical screening should reveal the presence of bioactive components of the plant extract such as flavonoids, alkaloids, saponins, tannins, and the antidiarrheal activity should indicate that the plant contains medicinal and therapeutic properties and can be used as medicine for combating diseases causes by selected bacteria.

**4.1 Expected Result**

**4.2 Conclusion**