STUDIES ON *FLACOURTIA FLAVESCENS* WILLD.

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CHAPTER ONE

INTRODUCTION AND LITERATURE REVIEW

Flacourtia flavescens Willd. is a deciduous shrub with a thorny stem belonging to the plant family Flacourtiaceae. This plant is found in tropical and subtropical regions. In Africa, it is widely distributed in countries south of Sahara desert. It is reported to be present in Niger, Nigeria, Senegal, Ivory Coast, Angola, Burkina-Faso, Madagascar, Mali, Guinea, Zimbabwe, Tanzania, Togo and Ghana. Easily found in dry coastal and savannah regions. It thrives well in rocky and clayey ground with an average or light rainfall. It is tolerant of heat, drought and semi-arid regions. [1, 2].

This plant is distinguishable from other *Flacourtia* species by its thorny stem, elliptic leaf blades tapering into an acute angle, the leaf base being cuneate, fruit size and absence of petals in its flowers. The fruit of is round and green resembling a small plum. The matured fruit is about 1.5-2 centimeters in diameter. The fruit is red or purple when ripe. The stem has several lateral shoots bearing simple leaves that are alternatively arranged, with petiole pubescent. The leaf surface is glabrous, with veins usually in 4-6 pairs.

This plant is commonly known as Niger plum. It is also known by several other vernacular names in localities they are found . In Nigeria, among the Yoruba tribe it is known as Kánk án dìká. In Burkina Faso, among the Moore tribe it is known as Kitenga. Among the Senufo tribe in Burkina Faso and Ivory Coast, it is known as diaramini or sofara. In Ghana, among the Ewes it is known as Hlonu, among the Akan-Twi it is known as piti piti, among the Dagaari it is known as voalu, the Ga people call it amugui, Moore people call it kwakadili, and the Sisaalas call it botong, among the wala tribe it is known as jarem piala or sarem piala. Among the Gbe-vhe people of Ghana, it is known as adeliãgo, adenega or nlewe [1].

Besides the ripe fruit which is edible, the leaf and stem bark of *Flacourtia flavescens* has several other uses. In agro-horticulture, it is used as hedges and markers. Due to its stout thorns and branches, it makes a good hedge for use as fences. The leaf, the bark and the root of this plant has several medicinal uses. In some parts of Ghana, the stem is chewed to cure diarrheic conditions. Among the Sisaala tribe of Northern Ghana and the Moore tribe of Burkina Faso, this plant is use as a purgative. In addition to its use as a purgative, the Moore people also use it

as a cholagogue to treat liver problems. The leaf of this plant is also use to treat cough. Among the Akan-twi tribe of Ghana, the root of this plant is use to treat toothache. In some other communities in Ghana, the leaf is use as an astringent and also to treat wound [1].

In Ghana, the leaf of *Flacourtia flavescens* is also part of herbal preparations some herbalists administer on HIV patients with the view of treating AIDS.

The extract of *Flacourtia flavescens* leaves is capable of regenerating damaged skin tissues due to wound infections. It also exhibit strong bactericidal activity against *Proteus* species, one of the major causes of wound infections.

Other Asian Flacourtia species have been reported to be used as eye wash, diaphoretic, tonic, to treat diarrhea, dysentery, stomach ache, dysmenorrhea, herpes, wounds, sores, and given to women after parturition [3]. Chaulmoogra oil obtained from *Hydnocarpus* species (a Flacourtiaceae) has long been best known for treating leprosy and other skin diseases [4- 6]. The bark of *Casearia multinervosa* and leaves of *Xylosma terrae-reginae* both an Australian species of Flacourtiaceae have been reported to show antitumor effect [7]. Some species of Flacourtiaceae have also been found to contain clerodane, kolovane diterpene esters and phenolic glycosides, some of these compounds have been reported to have cytotoxic, insect antifeedant and LEA-1/ICAM binding inhibitory activities [8]. The leaf extract of *Casearia sp.,* stem extract of *Casearia grayi* and stem extract of *Scolopia braunii* were found to have antioxidant activity, cytotoxic activity and antimicrobial activity [9]. The Methanol extracts of leaves, root and stem barks of *Flacourtia zippelii* is reported to have exhibited antibacterial activity [11]. *Casearia sylvestris, Ryania* and some other Flacourtiaceae were reported to contain alkaloids. *Ryania* is also well known for its insecticidal activities [10]. The fruits and seeds of *Flacourtia ramontchi* have been used by Chinese for the treatment of rheumatic arthralgia, dyspepsia, cholera and dysentery [12].

Daucosterol, β-sitosterol and ramontoside were reported to have been isolated from *Flacourtia ramontchi* [13]. Xing-Yun Chai et al.[14], have reported to have isolated lignan glycosides, a monoterpene glycoside, *threo*-dihydroxydehydrodiconiferyl alcohol[15], (-)-3α-O-(β-D-glucopyranosyl)-lyoniresinol [16], (-)-2α-O-(β-D-glucopyranosyl)-lyoniresinol [16], (rel)-2-(6-benzoyl-β-glucopyranosyloxy)-7-(1α,2α,6α-trihydroxy-5-oxocyclohex-3-enoyl)-5-hydroxybenzyl alcohol [17], Poliothyrsoside [18], salirepin [19], 3,4-dimethoxyphenyl 6-O-(α-L-rhamnopyranosyl)-β-D-glucopyranoside [20], kaempferol 3-rutinoside [21], quercetin 3-rutinoside [21], and 1-[α-L-rhamnosyl-(1→6)-β-D-glucopyranosyloxy]-3,4,5-trimethoxybenzene [22] from *Flacourtia ramontchi*.

Xing-Yun Chai et al.[14], also obtained Phenolic glycosides, lignan, idesin [23], syringin [24], 4-hydroxy-3,5-dimethoxybenzyl alcohol 4-O-β-D-glucopyranoside [25], 3,5-dimethoxy-4-hydroxy-

1-O-β-D-glucopyranoside [26], 5,5'-dimethoxy-7-oxolariciresinol 4'-O-β-D-glucopyranoside [27], syringaresinol 4',4"-bis-O-β-D-glucopyranoside [28], *threo*-dihydroxydehydrodiconiferyl alcohol [15], syringaresinol 4-O-β-D-glucopyranoside [29], (1,2,5)-cyclohex-3-enetriol [30], 19-isopimara-7,15-dien-3β-ol α-D-altropyranoside [31], o-phenylphenol, β-sitosterol and daucosterol from *Bennettiodendron leprosipes* (a Flacourtiaceae).

The use of Flacourtia plants to treat chronic cough, diarrhea, and wound has aroused interest in a scientific research into its antimicrobial activity (since chronic cough, diarrhea and wound infections has microorganisms as one of their major causes).

Infections such as bronchitis or pneumonia can cause coughing. These infections can be caused by microorganisms such as virus, bacteria or fungus. Bronchitis occurs most often due to a viral infection that causes the inner lining of the bronchial tubes to become inflamed and undergo the changes that occur with any inflammation in the body. These viruses include rhinovirus, respiratory syncytial virus (RSV), and the influenza virus. Bacteria such as *Mycoplasma, Pneumococcus, Klebsiella, Haemophilus* also causes bronchitis. The most common cause of a bacterial pneumonia is *Streptococcus pneumonia*. *Klebsiella pneumoniae* and *Hemophilus influenza* are bacteria that often cause pneumonia in people suffering from chronic obstructive pulmonary disease (COPD) or alcoholism. *Staphylococcus aureus* can also cause pneumonia.

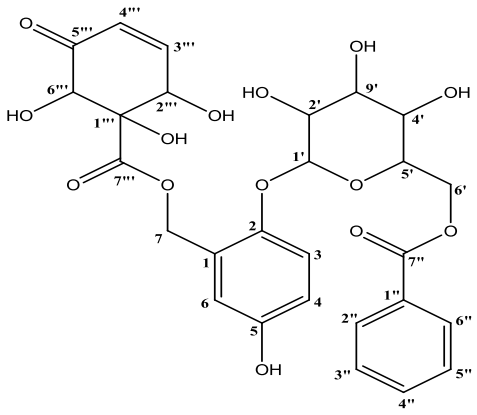
The most common cause of diarrhea include viruses such as Norwalk virus, cytomegalovirus, viral hepatitis, herpes simplex virus and rotavirus which is the most common cause of acute childhood diarrhea. *Giardia lamblia* and *cryptosporidium* are common parasites that also causes diarrhea. Common bacterial causes of diarrhea include *campylobacter*, *salmonella, shigella* and *Escherichia coli*.

A wound infection occurs when microbes enter a cut, puncture or laceration of the skin. These microbes, mostly bacteria, attach to the tissues causing wounds to stop healing. Pathogens commonly associated with wound infections are *Staphylococcus aureus*, Coagulase-negative staphylococci, Enterococci, *Escherichia coli, Pseudomonas aeruginosa, Enterobacter* sp.*, Proteus mirabilis, Klebsiella pneumoniae,* and *candida albicans.*

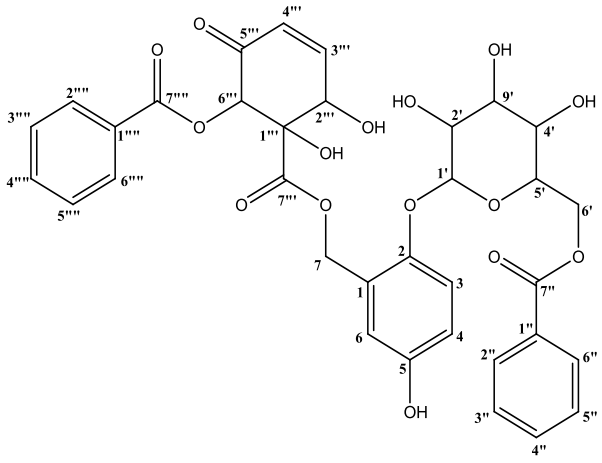
Though there are existing antimicrobials for the treatment of these microbial infections, it has been established that over the years these pathogens tends to develop resistant to the available drugs hence the need for continual research into other possible sources of new antimicrobial.

Even though, are several reports on the chemical constituents and antimicrobial activities of several Asian Flacourtiaceae, there has been no report on *Flacourtia flavescens* Willd., a common *Flacourtia* species in Ghana and other African countries which is widely used for treating infectious diseases.

In this dissertation, the effect of the extract of the leaf, the bark and the two major compounds ($C_{27}H_{28}O_{14}$ and $C_{34}H_{32}O_{15}$) isolated from the methanol extracts of *Flacourtia flavescens* willd has been tested on some of the common microbes with the view to ascertaining their antimicrobial potential.



$C_{27}H_{28}O_{14}$



$C_{34}H_{32}O_{15}$

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Flacourtia flavescens Willd.