

Antimicrobial screening and phytochemical analysis of *Carica papaya* Leaf extracts

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Abstract

A rekindled interest in the pharmaceutical importance of plants has led to the discovery and adoption of plant extracts which were commonly used in traditional medicine, as alternative source of remedy. In the present study, the phytochemical and antimicrobial effect of *Carica papaya* .L leaf extract was investigated using standard method. The result revealed that the plant contained some bioactive compounds which include, Alkanoids (0.05±0.01), Flavonoids (2.80±0.11), Saponins (0.07±0.02), Tannins (1.05±0.01). the antimicrobial activity of the plant showed that the plant had a broad spectrum activity against the test isolate with varying zones of inhibitions ranging from 16.0mm, 18.4, 15.0, 16.5, and 13.0mm for *S. aureus*, *E. coli*, *S. typhi*, *P. aeruginosa*, and *C. albican* respectively at 100% concentration of the ethanolic extract. However, the organic solvent extract showed more effect compared to the aqueous extract. The present study therefore suggest the use of plant base antimicrobial (*Carica papaya* .L) as an alternative to chemotherapeutic agents.

Keyword: Phytochemicals, Antimicrobial, *Carica papaya* .L.

INTRODUCTION

Around the world, at least thirty five thousand (35,000) plant species are used for medical purpose (Kong et al., 2003) and virtually all plant parts are usually consumed as food for efficient supply of energy. Most important industrial medicines are being synthesized from about 90 species of herbs and in developing countries like Nigeria, traditional medicines are usually based on herb mixtures collected from the wild. However, attention has been given to the medicinal values of plants and plants remedy in safety, efficiency, economy, and its suitability as food for efficient of energy. Most medicaments especially African, traditional medicines are prepared often from combination of two or more plant product *Carica papaya* belongs to the family of Caricaceae, and several species of Caricaceae have been used as remedy against a variety of diseases (Mello et al., 2008). Papaya offers not only the luscious taste but is a rich source of antioxidant nutrients such as carotenes, vitamin C and flavonoids; the B vitamins, folate and pantothenic acid; and the minerals, potassium and magnesium; and fiber (Sulaiman, 2011). Together, these nutrients promote the health of the cardiovascular system and also provide protection against colon cancer. The fruit is valued for its proteolytic enzymes including papain, which is used like bromelain, a similar enzyme found in pineapple, to treat sports injuries, other causes of trauma, and allergies.

The fruits, leaves, seeds and stem of *Carica papaya* contain novel biological active compounds, which are potent as therapeutics or useful in industrial processes. Adebisi et al. (2002) assayed that the pharmaceuticals of unripe pulp of *Carica papaya* reported only the presence of saponins. Reports have also shown that the active compounds present in the stem of *Carica papaya* were active against *Malassezia species*. Carapine, an alkaloid present in papaya, can be used as a heart depressant, amoebicide and diuretic. The fruit and juice are consumed for gastrointestinal ailments; a fresh leaf poultice is used to treat sores. The fresh root with sugarcane alcohol can be taken orally or as a massage to soothe rheumatism. A flower decoction is taken orally for coughs, bronchitis, and asthma and chest colds. In some

countries, the seeds are used as an abortifacient and vermifuge. The present study was undertaken to evaluate the phytochemicals and antimicrobial properties of *Carica papaya* leaves.

MATERIALS AND METHODS

Sample collection

The papaya stem was collected from Umuchichi Community of Aba, in Osisioma Ngwa LGA of Abia State.

Sample preparation

The fresh stem sample was collected and washed with tap water. It was spread on a paper to facilitate drying. The washed sample was sundried for four days, so that no nutrient and phytochemical present will be lost. The sundried sample was grinded with a blender until the stem turned into fine powder. It was stored in an airtight container and kept for analysis.

Phytochemical analyses

Phytochemical analyses include the Phenol determination, determination of Saponin, determination of Alkaloids and Flavonoids determination. All of these were determined based on methods of analyses described by AOAC, (1990).

ANTIMICROBIAL ANALYSIS

Test Isolate

The test organism used, were all human pathogenic organism from clinical origin. They were obtained from stock cultures in the department of microbiology Abia state polytechnic, Aba.

The organisms were collected, identified and subculture in nutrient agar slants and incubated at 37°C for twenty four (24) hours. They were then kept as stock in the refrigerator at 4°C until when required for the analysis.

Extraction of Plant Material

The ethanol and aqueous extract of both plant samples was carried out according to Harborne (1993). 300g of the powdered leaves was weight out and dissolved in 100ml of both solvent in a sterile beaker and allowed to stand for twenty four (24) hours. The mixture was filtered using WhatMan No.1 filter paper and the extracts was evaporated to dryness at 45°C. the residues obtained were reconstituted in 100% ethanol and water at stock concentration, stored in the refrigerator at 42°C until used.

Sensitivity Test

The disc diffusion technique was used (Cheesbrough, 2000). The circular discs were put in the different reconstituted extract. The discs were allowed to absorb the extract which becomes condition. The test organism were cultured by evenly spreading into sterile agar media on separate Petri dishes then the disc haven allowed to air dried were placed on the inoculated plates at appropriate distance from one another. The plates were allowed to stand on the table for some minute and incubated at 37°C for 24hrs for bacterial and at room temperature for 2-5 days for fungi after which clear zones (zones of inhibition) were measured using a transparent rule. Three measurements were taken for each sample and a mean value was recorded.

RESULT

Table 1 shows the qualitative and quantitative phytochemical constituent of *Carica papaya* .L leaf. The result showed that the plant contained Alkanoids, flavaonoids, saponins, and tannins at different concentration with flavonoid as the highest followed by tannins.

Table 1. Qualitative and quantitative constituent of phytochemical compounds present in *Carica papaya* leaves

Parameters	Qualitative	Quantitative
Alkanoids	+	0.05±0.01
Flavonoids	-	2.80±0.11
Saponins	+	0.07±0.02
Tannins	+	1.05±0.01
Terpernoids	-	Nil
Steroids	+	Nil

Table 2 shows the mean diameter of zones of inhibitions for the ethanolic extract on the test isolates with *E. coli* being the most susceptible isolate at 100% concentration(18.4mm) and *C. albican* the least susceptible(13.0mm).

Table 2. Mean diameter of zones of inhibition for the effect of ethanol leaf extract of *Carica papaya* on clinical isolates

Organism	Concentration (%) / Zones of inhibition (mm)				Control	
	25	50	75	100	A	B
<i>S. aureus</i>	8.0	10.0	14.1	16.0	18.5	NA
<i>E. coli</i>	11.2	14.5	15.0	18.4	19.6	NA
<i>S. typhi</i>	7.8	9.6	13.5	15.0	22.3	NA
<i>P. aeruginosa</i>	8.6	11.9	4.4	16.5	20.8	NA
<i>C. albican</i>	6.9	9.3	11.2	13.0	NA	20.1

KEY: NA = Not Applicable

Table 3 shows the mean zones of inhibitions for the aqueous extract with *E. coli* as the most susceptible isolate (14.6mm) and *C. albican* as the least (9.5mm).

Table 3. Mean diameter of zones of inhibition for the effect of the aqueous extract of *P. quajava* leaves

Organism	Concentration (%) / Zones of inhibitions (mm)			
	25	50	75	100
<i>S. aureus</i>	NIL	8.1	11.2	14.0
<i>E. coli</i>	NIL	7.2	10.5	14.6
<i>S. typhi</i>	NIL	NIL	7.0	10.2
<i>P. aeruginosa</i>	NIL	NIL	7.1	11.3
<i>C. albican</i>	NIL	NIL	6.8	9.5

DISCUSSION

The use of medicinal plants to treat and manage various forms of diseases and dysfunctions is becoming increasingly popular and has received wide acceptance (Grubben and Denton, 2004). Nigeria, an important nation of biodiversity, is enriched with herbal resources. Reports on the effects of these medicinal plants on animal and human health are diverse. Although these effects are largely attributed to the active components of these plant materials (Okenwa et al., 2012; Zaid et al., 2002), yet information on the chemical composition of many of these plant materials are still scarce (Akpanabiatu et al., 2006). The chemical evaluation of medicinal plants and their isolates have transformed traditional medicine from an almost invisible trade into a modern industrial enterprise, capable of making significant contribution to both health care delivery and economic growth of most developing countries (Iwu, 1989). Moreover, the World Health Organization (W.H.O.) had recognized traditional herbal medicine as a building block of primary health care (Akerlele, 1998).

In the present study, the result for the papaya showed that the plants contained some phytochemical compounds which possess good antimicrobial properties on the test clinical isolates used in the study. The phytochemical analysis of the plant showed that the flower contain saponin, Tannin, Alkaloids and Flavonoids. This finding can be attested to the work of Sikanda et al. (2013) who also reported similar finding and also stated the effect of these phytochemical as a good antimicrobial agent on different test organism. Doughari et al. (2007), reported the anti-bacterial effect of the root extract of *C. papaya* on various bacterial isolates including *B. cereus*. The presence of Saponin supports the fact that pawpaw flower has cytotoxic affect such as permenlization of the intestine as saponin are cytotoxic (Okwu and Okwu, 2004). Alkaloids are the most efficient therapeutically significant plant substance. Pure natural and synthetic derivatives of alkaloids are used as a basic medical agent because of their analgesic, antispasmodic and antibacterial properties (Stray, 1998). The presence of Alkaloid in the flower shows that this plant can be effective anti-malaria agent since

alkaloid consists of quinine, which is anti-malaria (Robinson, 1995).

The results of this study demonstrated that the organic extracts were more effective than aqueous extracts. This may be due to the better solubility of the active components in the organic solvent. The ethanol extracts demonstrated a higher activity than the aqueous extracts in both leaf samples. The better efficacy of the ethanol extract as against the aqueous extract may be because different solvents have different polarities, hence different degrees of solubility for the various phytoconstituents (Uwah et al., 2013; Doughari, 2008). Based on the limited effect of activity of the other extracts compared with the ethanol extracts, it suggests that the active component is more soluble in ethanol than in the other solvents. However, Doughari et al. (2007) stated that the anti-microbial effect of this plant could be due to the bioactive compounds such as the phytochemical constituent present in the plant.

Comparing the sensitivity of the microbial strains to both the plant extracts and to synthetic antibiotics, the result showed that the plant extracts compete favorably with the drugs and can be used as an alternative to the antibiotics as the zones on inhibition shown were very comparable and the extracts have lesser side effects which are often associated with the use of antibiotics (Marchese and Shito, 2001; Poole, 2001). Also the issue of resistance to these extracts cannot arise as is found with antibiotics (Kareem et al., 2010).

CONCLUSION

In conclusion, The presence of bioactive substances have been reported to confer resistance to plants against bacteria, fungi and pests and therefore explains the demonstration of antimicrobial activity by the plant extracts used in this study. Plant-based antimicrobials have enormous therapeutic and preferential potential; they can serve the desired purpose with lesser side effects that are often associated with synthetic antimicrobials used presently.

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