Advances in Science and Technology, Vol. 4, No. 1, March / April 2010, pp 45 - 48

Antimicrobial Properties and Preliminary Phytochemcial Analysis of *Carica Papaya Leaf*

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(Submitted: April 12, 2009; Accepted: February 16, 2010)

Abstract

Antimicrobial activity of *Carica papaya* was investigated using Agar and disc diffusion methods against *Escherichia coli, Staphylococcus aureus; Salmonella typhi, Bacillus* sp and *Proteus vulgaris.* The phytochemical screening revealed the presence of tannins, alkaloids, saponins, glycosides, flavonoids, anthroquinones, phenols, and fats and oil which vary in degrees. All the microorganisms were sensitive to extracts from *Carica papaya* leaves. The minimum inhibition concentration (MIC) ranging from 46.5 to186mg/ml showed more activity against the test organism. This demonstrates the antimicrobial potential of *Carica papaya* which can be exploited for future use.

Keywords: *Carica papaya*, phytochemical properties, antimicrobial activitiy, minimum inhibition concentration.

1.0 Introduction

The World Health Organization Consultative Committee (Sofowora, 1982) defined a medicinal plant as any plant in which one or more of its organs contains substances that can be used as precursors for the synthesis of useful drugs. *Carica papaya*, a tropical plant is one of such useful medicinal plants

Papaya is cultivated for its ripe fruits which is favoured as breakfast fruit and as an ingredient in jellies or cooked in various ways. The Juice is used to make a popular beverage. *Carica papaya* yields a milky sap often called latex which is a complex mixture of chemicals, chief among them is papain, a well known proteolytic enzyme. Its young leaves, shoots and fruits are cooked as vegetable while its latex is used to remove freckles. Its fruit and seed extracts have pronounced bactericidal activity against *Staphylococcus aureus, Bacillus cereus, Esherichia coli, Pseudomonas aeruginosa* and *Shigella flexneri (*Osato et. al., 1993). Papain has been used in textiles industry, food gumming, silk and wool softening.

However, the leaves and roots of *Carica papaya* contain cyanogenic glucosides which form cyanide. The leaves also contain tannin (Osato *et al.*, 1993). Both of these compounds, at high concentration, can cause adverse reactions. The latex with minimum protein concentration of 138ml/ml and root extracts inhibited *Candida albicans*. However, aqueous extracts were not active (Giordani, *et al.*, 1996). Extract of pulp and seed showed bacteriostatic properties when tested against *Staphylococcus aureus, Escherichia coli, Salmonella typhi, Bacillus subtilis* and other bacteria in vitro (FDA drug bull 2000).

Carica papaya fruits and leaves have a great effect on human digestive tract. It purifies the tract and helps in removing toxin from our body. Papain, carpain and pseudocarpine present in papaya act on the heart and respiratory system but easily get destroyed by heat. Papain also finds its usage in treating ulcers and diphtheria where it is helpful in dissolving the membrane (Akah *et al.*, 1997). It is also employed in reducing swelling and fevers. Extract of chemopapain has been used in treatment of ailments related to disc prolapses and slip disc. The freshly dried papaya seeds possess glycone that has the bacteriostatic, bactericidal, amoebicidal and fungicidal action.

The present study was therefore carried out to determine antimicrobial properties and preliminary phytochemical analysis of *Carica papaya* leaf.

2.0 Material and Methods

The *Carica papaya* leaves were collected from

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Government botanical garden Aba, Abia state. Preliminary phytochemical analysis was carried out using the standard procedures of Trease and Evans (1989) and Harbone (1973).

2.1 Antimicrobial Activity

Stock culture of *Staphylococcus aureus, Escherichia coli, Salmonella typi, Bacillus* sp and *Proteus valgaris* were obtained from Federal Medical Centre, Owerri. Two solvents namely ethanol and water were used for the preparation of the extracts. Twenty grams of dried ground *Carica papaya* leaves was soaked in 100ml of mixture of ethanol and water in conical flask. This was vigorously shaken for 3 minutes and allowed to stand for 73 hours to effect proper extraction of the active principle. The suspension was filtered with pore size material to obtain the supernatant while the debris was discarded. The extracts were finally obtained by removal of ethanol and water through distillation.

2.2 Evaluation of the Anti-bacterial effect of plant extract.

Plant extract disc was first obtained using standard filter paper to prepare 2mm paper disc with the aid of a perforating machine. This paper discs were thereafter sterilized by autoclaving at 121°C for 15minutes and later impregnated with the plant extracts under aseptic condition.

2.3 Antibiotic Sensitivity Tests

Sterile nutrient agar was prepared and incubated aseptically at 37°C for 24hours to dry the plates and as well check for sterility.

2.3.1 Agar Diffusion Method

The cup plate method of agar diffusion technique (Garred and Graddy, 1983), was employed to determine the extent of inhibition of the test organisms. The nutrient agar plates were flooded with the test organisms and left for 30 minutes at room temperature for pre-diffusion to take place. The culture plates were incubated at 37°C for 24 hours before being examined for inhibition of growth of the test organisms.

2.3.2 Filter Paper Disc Method

This method was used to determine the antibacterial potency of the extract on the microorganisms. In this method, the filter paper was sterilized in hot oven for 2 hours at 160°C and when cooled, was impregnated with the above extracts and placed on the nutrient agar plate flooded with the test organism. Measurement of zone of inhibition was achieved using 5mm ruler placed across the diameter. The minimum inhibitory concentration of *Carica papaya* leaves was determined by the tube method (Garred and Graddy, 1983).

3.0 Results and Discussions

The result of preliminary phytochemical screening of dried leaves of *Carica papaya* using the standard procedures of Trease and Evans (1989) and Harbone (1973) revealed the presence of alkaloids, saponin, tannins, flavonoids and glycoside (see Table 1).

Table 1: Phytochemical Screening Result of *Carica papaya*

Chemical components	Indicator
Alkaloids	+
Saponins	+
Tannins	+
Flavonoids	+
Glycoside	+
Anthroquinones	_
Phenols	_
Fats and oil	_

+ = positive - = not detected

These chemical compounds are known to display physiological activity against many micro-organisms (Farnsworth, 1966; Rojas , 1992; Banso and Olutimeyin, 2001). Burapadaja and Bunchoo (1995) have demonstrated that the presence of tannins in the leaf extracts of *Terminatia citrine* inhibited cell wall formation in fungi leading to death of the organisms. From the test of antimicrobial activity using Agar diffusion and disc diffusion methods for zone of inhibition (Table 2) all the test microorganisms were sensitive to pawpaw leaves which gave the highest zone of inhibition 2.0mm with *Salmonella typhi* in Agar diffusion method. This corroborates the findings of Osato, 1993.

The minimum inhibitory concentration (MIC) of ethanolic extraction of *Carica papaya* for the test organisms ranged from 46.5 to 186 mg/ml (Table 3) with *Salmonella typhi* showing the highest activity (46.5mg/ml). Similarly, the MIC of water extraction of *Carica papaya* had *Salmonella typhi* showing the highest activity (44.5 mg/ml) among the test organisms.

These findings therefore provide some justification for the utilisation of leaf extracts of *Carica papaya* in traditional medicine for the treatment of diseases.

4.0 Conclusion and Recommendation

The inhibitory effect of extracts of *Carica papaya* on some microorganisms such as *Staphylococcus aureus, Salmonella typhi, E. coli, Bacillus* sp and *Proteus vulgaris* provides scientific justification for its use for treatment of some diseases. Further indepth studies of the efficacies of *Carica papaya* extracts as therapeutic agent is recommeded.

Table 2: Zone of inhibition of growth on *Carica papaya* leaves

	Agar Diffusion Method	Disc method
Organism	*Carica papaya*	*Carica papaya*
Esherichia coli	0.5mm	0.8mm
Staphylococcus aureus	0.2mm	0.lmm
Bacillus sp	0.lmm	0.8mm
Salmonella typhi	2.0mm	1.5mm
Proteus vulgaris	1.5mm	1.0mm

Table 3: Minimum inhibitory concentration of ethanolic extraction of *Carica papaya* with the test organisms, incubated at 37°C for 25 hours.

Test tube number	A	B	C	D	E
Serial dilution	1:2	1:4	1:8	1:16	1:32
concentration of *Carica papaya* extract (mg/ml)	186.00	93.00	46.50	23.25	11.52
Staph. aureus	-	-	-	-	-
Salmonella typhi	+	+	+	-	-
Bacillus sp	-	-	-	-	-
E. coli	+	+	-	-	-
Proteus vulgar	+	-	-	-	-

- = No growth + = growth occurred

Table 4: Minimum inhibitory concentration of water extraction of *Carica papaya* with test organisms at 37°C for 24 hours.

Test tube number	A	B	C	D	E
Serial dilution	1:2	1:4	1:8	1:16	1:32
concentration of *Carica papaya* extract (mg/ml)	184.00	91.00	44.50	21.25	9.62
Staph. aureus	-	-	-	-	-
Salmonella typhi	+	+	+	-	-
Bacillus sp	-	-	-	-	-
E. coli	+	+	-	-	-
Proteus vulgaris	+	-	-	-	-

- = No growth + = growth occurred

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