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ANTI BACTERIAL ACTIVITY AND MEDICINAL PROPERTIES OF PAW PAW (*Carica papaya*)

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ABSTRACT

The antibacterial activity and medicinal properties of *Carica papaya* (paw paw) were studied. Paw paw leaves and the roots were extracted using solvents, n-hexane, ethyl acetate, ethanol and water. The extracts were then assayed for bacterial activity and inhibition of bacterial growth. The results show that all the extracts except the water extract have antibacterial activity and that the inhibition of bacterial growth was dose dependent. The results also showed that paw paw extracts posses medicinal properties and could be used for the treatment of bacterial infections.

KEY WORDS: Paw paw, Antibacterial activity, inhibition of bacterial growth, Terpenoids and Medical Properties.

INTRODUCTION

Paw paw (*Carica papaya*), known in many communities as one of God's wonderful gifts to humanity is a native of South America, cultivated there since the Pre Columbian times. It got to Europe about 1690 AD and Asia in the 18th Century (Anselm, 2000). It is now grown all over Tropical Africa and sometimes used ornamentally in some parts of the world. In many places the leaves have been used as soap. It is known to improve the digestion of proteins and expel worms. The ripe fruits are rich in vitamins A, B. and C. It therefore can be used to cure eye sight, nerves and muscles, and strength then the immune system (Morah, 2009). The seeds are used to expel worms. The unripe paw paw fruit can be used to treat chronic external ulcers or sores.

It is locally used to cure/treat malaria, diabetes, stomach ulcers, convulsion, asthma, bronchitis, piles, impotence, and the white milky sap of the unripe paw paw contains a high percentage of papain which is used for chronic external ulcers. As a result of these assertions it has become important that the paw paw be thoroughly investigated.

Fig. 1: Paw paw fruit.

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MATERIAL AND METHODS

Collection and treatment of sample

Paw paw roots were obtained at the Marian Market (Calabar, Nigeria). The roots were sun dried for seven days and ground into fine powdered using an electric grinder. Then 100g of the powder mass obtained was stored in clean sterile bottles at room temperature and used for the extractions.

The Soxhlet ethanolic extract was obtained by Soxhlet extraction of 20 g of paw paw powder in 100 ml of 95% ethanol at 78^{o}C using Soxhlet apparatus. The extract was then concentrated to 20 ml on a water bath and dried at room temperature.

The n-hexane extract was obtained by soaking 20 g of the powder paw paw in 100 ml of n-hexane in a conical flask. The mixture was stirred, covered, and allowed to stand for 24 hrs, and filtered using sterile Whiteman No.1 filter paper. The filtrate was concentrated to 20 ml on a water bath and evaporated to dryness at room temperature. The ethyl acetate and water extracts were obtained by repeating the above procedure for n-hexane. The various extracts were used for the analysis of antibacterial activities and bacterial inhibition assay.

Antibacterial activity

The antibacterial activity was determined by the diffusion method of Kirby Bauer described by Duguid *et al*, (1989). This method determines the antibacterial activity of the extracts.

Preparation of the nutrient medium

Nutrient agar medium was prepared by dissolving 2.8g of nutrient agar in 100ml distilled water. The solution was sterilized in an autoclave at 121^{o}C at 1. 1N pressure for 15 min. The suspension was cooled and poured into sterile Petri-dishes to solidify. The agar depth of the medium was 4.0mm.

Preparation cultures and inoculation

Pure cultures of *Coliform bacillus*, *Staphylococcus epidermidis* and *Streptococcus viridians* obtained from the Microbiology Laboratory in the Department of Microbiology, Cross River University of Technology, Calabar, Nigeria, were separately used to inoculate the Petri-dishes. This was done by streaking the surface of the plates in a zigzag manner until the entire surface was then covered. The inoculated plates were then incubated at room temperature for 24 hours.

Assay of bacterial inhibition activity

The extracts were serially diluted to obtain 1.0%, 0.5%, 0.25%, and 0.125% solutions in sterile test tubes. Sterilized 9mm filter paper disc soaked in the diluted extracts were placed on the plate and incubated for 24 hours at room temperature.

The plates were examined for clear zones of inhibition. Presence of zones of inhibition indicated activity. The zones were measured.

RESULTS

Table 1 presents the results of antibacterial activity of the paw paw extracts. The results showed that the entire extracts except the water extract have antibacterial activity.

Table 2 presents the results of bacterial growth by the extracts. The results showed that the extracts are dose dependent since no activity was observed at very low concentrations.

Table 1: The antibacterial activity of the paw paw roots extracts.

Sample	n-hexane extract	Ethyl acetate extract	Ethanol extract
Coliform bacillus	+	+	-
Staphylococcus epidemidis	+	+	-
Streptococcus viridans	+	+	-

Table 2: Inhibition of bacterial growth by the paw paw extracts.

Test organism	Dilution (%)	Zone of inhibition (mm)			
		n-hexane	Ethyl acetate	Ethanol	Water
Coliform bacillus	1.00	4.0	5.0	5.5	-
	0.50	1.5	2.5	3.0	-
	0.25				-
	0.125				-
Straphylococcus epidermidis	1.00	4.5	5.6	6.5	-
	0.50	2.5	3.5	4.0	-
	0.25		1.0	2.5	-
	0.125				-
Streptococcus viridans	1.00	5.0	5.6	7.0	-
	0.50	3.0	4.0	4.5	-
	0.25				
	0.125				

DISCUSSION

The results for the antibacterial screening have shown that all the extracts except the water extract have antibacterial activity. The results of the inhibition of bacterial growth have shown that the extracts are active at high concentration and inactive at very low concentrations. Thus the study suggests that the inhibition of bacterial growth activity of the extracts is dose dependent. The ethanol extract appears to be most active and can be beneficial in the treatment of bacterial infections.

The antibacterial activity and inhibition activity of paw paw extracts could be attributed to the chemical properties of paw paw. The main constituents of paw paw are sesquiterpenoids with zingiberene as the main component. Other components include β-sesquiphellandrene, bisabolene and farnesene, which are sesquiterpenoids, and trace monoterpenoid fraction, (β-sesquiphellandrene, bisabolene and farnesene, which are sesquiterpenoids, and trace monoterpenoid fraction, (β-sesquiphellandrene, cineol and citral) (O'Hara *et al*, 1998). The terpenoids are of important in pharmacy due to their relationship with such compounds as vitamin A and could be of immense medical applications. Terpenoids are reactive compounds. Paw paw has a sialagogue action, which stimulate the product of saliva, and can be used to disguise the taste of its medicines (O'Hara *et al*, 1998). The paparoid could make paw paw available for treatment of stomach acidity and has analgesic and sedative properties (O'Hara *et al*, 1998).

In conclusion, this study has shown that paw paw extracts posses medicinal properties, antibacterial activity and that the inhibition of bacterial growth was dose dependent.

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