Comparative Molluscicidal Activities of Fruit Pericarp, Leaves, Seed and Stem Bark of *Blighia Unijugata* Baker

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ABSTRACT

Introduction: The plant is used in ethno-medicine as a fish poison and belongs to family known to contain saponins which are toxic to cold-blooded animals including snails acting as vectors of organisms responsible for many human diseases including schistosomiasis. **Methods:** The mollusccidal activities of 50% ethanolic extracts of the seeds, fruit pericarp, leaves and stem bark as well as the fractions of the fruit pericarp of *B unijugata* Baker were evaluated on *Biomphalaria glabrata*.snails **Results:** The crude extract of fruit pericarp was the most active among the morphological parts tested with LC_{50} of 15 µg/ml while Ethyl- Acetate fractions showed the highest activity of the 3 fractions with a LC_{50} of 7.6 µg/ml and satisfied the condition set by World Health Organization for a potential plant molluscicides either as a crude extract or as a fractions **Conclusions:** the results confirmed the ethno-medicinal uses of the plant and can be so regarded as a potential molluscicides in the snail vector of *schistsomiasis*

Key words: *Blighia unijugata,* Bak, Fruit pericarp, *Biomphalaria glabrata*, fruit pericarp, *schistosomiasis*

INTRODUCTION

Schistosomiasis is a debilitating disease affecting close to 4-5% of the world population[1] and approximately 90% of these estimated cases of human schistosomiasis lives in sub-Saharan Africa. Within the sub-Saharan Africa, Nigeria is the country with the most cases of human *schstosomiass* which is widespread in both the urban and rural communities.[2]

Epidemiological studies showed the prevalence rates to be high, for example 26% of school children were found to be infected in Anambra state, south eastern Nigeria.[3] while 21% of school children, 18.4% of local dry cleaners and 15 .8% of vehicles washers were found to be infected in studied population in Ibadan South western Nigeria while prevalence rates of 26.6-36.8%were found in some localities in Kano, North Eastern Nigeria.[4]

Chemotherapy is one of the most valuable methods in the cure of *schistosomiasis* but chemotherapy provides only temporary abatement of human parasites burden because of rapid re-infection rates subsequent to drug intervention and the fact that the drug is ineffective to immature stage of the parasite.[5,6,7] Experience has shown that in high risk setting, cessation of drug treatment for even a few years can result in recurrence of high level of *Schistosoma* infection among adults and children as if the community had never been treated.[8] Evidence suggest that countries such as China and Philippines controlled their *Schstosomiasis* by combining the destruction of amphibian snails control with treatment of infected humans[9] and without changes in *Schistosomiasis* transmission potential even multiple years of annual drug treatment will not be adequate to prevent *Schistosoma* infection in many high risk areas. and this may lead to onset of both community and donor fatigue in large scale drug treatment projects if disease control is not fully effective and durable over the long term.[8]

This insight couple with the indication that resistance to Praziquantel might develop in future and the fact that some side effects associated with Praziquantel may reduce drug compliance in primary health care[10] has buttressed the view that mollusccide*s* *schistosomes* transmitting snails still has a useful part to play in integrated control schemes for this important disease and a pressing need for more selective and efficient molluscicide for the control of snail vector.[11,12]

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The plant material

The plant *Blighia unijugata* Baker family Sapindaceae is a small to medium-sized tree up to30 m tall widespread in tropical Africa.

Ethno-medicinal uses

Like all other plants used in ethno-medicine the uses varies from place to place but the traditional used related to the present work is the use of macerated twigs, leaves, flowers and fruit as a fish poison and the coastal people in Nigeria.

The leaves are eaten as vegetable and various part of the tree are considered to have sedative and analgesic properties and are used in traditional medicine for the treatment of rheumatism, kidney pain and stiffness. Fruits have also been used for the treatment of nausea and vomiting.[13]

Like all other members of the Sapindaceae family saponins are believed to be present.

Saponins are naturally occurring plant glycosides, which form a soapy latter with water.

There is a high correlation between plants employed as fish poison or soap substances and their molluscicidal activity[14] and many potent molluscicides of plant origin were triterpenoids saponins and some triterpenods have actually been isolated from this particular plant and they include the following triterpenoids friedelin and epifriedelinol.[15]

MATERIALS AND METHODS

Plant Collection

The various parts of the plants were collected along Ologuneru in Iddo Local Government of Oyo State in March 2010 with the assistance of Mr. Benjamin Daramola and Mr. Odewo both member of staff of University of Lagos Herbarium who identified it and a voucher specimen was deposited at the University of Lagos Herbarium with voucher number LUHN 3325.

Each plant part was allowed to dry at room temperature and 50 g of leaves 10 g each of seed, stem bark and fruit pericarp were macerated with 50% Ethanol for 72 hours filtered and concentrated to dryness at 30 °C under vacuum using a rotary evaporator.

The extraction was carried out thrice and the yield for each plant part was calculated.

For the preparation of the fractions from the fruit pericarp, 71 g of the powdered peicarp was macerated for 72 hours with 50% ethanol, filtered and the filtrate concentrated to dryness under vacuum to yield 10.30 g of the dried extract and out of this 9.80 g was dissolved in water and partitioned between ethyl acetate, butanol and water to give 2.77 g of ethyl acetate fraction, 2.81 of butanol and 3.35 of water fraction respectively.

Molluscicidal Screening

Snails for the experiment were collected from streams that has not been subjected to either synthetic or plant molluscicides. The snails were identified by Dr. Olorunmola of Drug Research and Production Unit of Obafemi Awolowo University Ile-Ife Osun State. They were allowed to acclimatize in the laboratory for two weeks before use. The molluscicidal test was divided to two stages;

Rapid Screening Test

The methods described by various authors[16,17,18] were used with slight modification such that concentrations of 1000 and 500 ppm were used. Extract which show 100% activities at concentration 500 ppm were then used for the final screening test. The extract with the activity within the WHO recommended guidelines was fractionated into, Ethyl Acetate, Butanol and Water fractions and each fraction subjected to further screening to determine where activity resides

Final Screening Test

A different method[19] was used for the final screening test but Copper Sulphate was used as positive control at a concentration of 1 ppm and was set up in duplicate which gave 100% mortality and 500 ml de-chlorinated water was used as negative control. The same method used for the crude extracts was also used for the screening of the various fractions.

The lethal concentration that kills 50% of the snails was determined with the use of probit analysis table with value plotted on graph paper to determine the LC_{50}.

RESULT AND DISCUSSON

Results of Rapid Screening Test

Data in Table 1 below from Rapid Screening show that the leaves and the seed gave 100% mortality at 1000 ppm

Table 1: Results of Rapid Screening

Plant parts	Concentration ppm	%Mortality
Leaves	1000	100
	500	0
Seed	1000	100
	500	0
Stem bark	1000	100
	500	100
Fruit pericarp	1000	100
	500	100

Table 2: Results of Mollucsicdal Screening of Stem Bark and Fruit Pericarp

Plant Parts	Concentration (ppm)	% Mortality	LC_{50} ppm
Stem bark	1000	100	
	500	100	
	250	0	
Fruit pericarp	1000	100	
	500	100	
	250	100	
	125	100	
	100	100	
	75	100	
	50	100	
	40	100	
	30	100	15
	20	0	
	10	0	
	5	0	
Positive Control Copper Sulphate	1 ppm	100	
Negative Control	(500 ml) De-chlorinated water	0	

Table 3: Results of Molluscicidal Activity of the Fractions of Fruit pericarp

Fractions	Conentration ppm	%Mortality	LC_{50}
Ethyl-Acetate	30	100	
	20	100	7.6
	10	100	
	5	0	
Butanol	30	100	
	20	100	15
	10	0	
	5	0	
Water	30	100	
	20	0	25
	10	0	
	5	0	

Positive and Negative Control were set up as in above.

but no activity at 500 while the stem bark and fruit pericarp show 100% mortality at both 1000 and 500 ppm and both are then used for the molluscicidal screening

Result from Table II above showed that the fruit pericarp has the highest activity and was subsequently fractionated to Ethyl-Acetate, Butanol and Water

The result of the molluscicdal bioassay showed that of the four morphological parts tested, only the stem bark and the fruit pericarp were active at concentration of 500 ppm and below with the fruit pericarp having the highest activity with LC_{95} and LC_{50} of 15 and 7.6 ppm. The result of the fruit pericarp alone without the seed suggest that the concentration of the active compounds are more in the fruit pericarp and that may be the reason why molluscicidal activity of the powdered dried fruit were found to be lower as carried out by[20] where the LC_{95} values were 98.7 for adult *Bulinus globules* and 98.5 for *Bulinus truncates*. The seed has been shown to be a good source of protein, carbohydrate, minerals and crude fiber and can serve as feed supplement and the oil from the seed can be used in the production of soap and lather shaving cream.[21] This fact should serve as impetus to the local people who can be encouraged to exploit the commercial benefits as well as the health benefits of this plant since *schistosomiasis* has been shown to be both a cause and an effect of continuing rural poverty in endemic areas.[22]

In the case of the 3 fractions of the fruit pericarp activity increases from the Water fraction to Butanol fraction with Ethyl-Acetate fraction having the highest activity with LC_{50} of 7.6 ppm respectively. For a plant to be considered as a potential molluscicide according to the World Health Originations (WHO) guidelines a methanolic or lipopholic extracts should be active at equal to or less than 20 µg/ml to kill 90% of snails exposed for 24 hours.[12] It must also be freely solubility in water since the medium of final usage will be water. It is only the fruit pericarp of *Bl. unijugata* Baker that met this condition and may be a candidate for further studies While the criteria for solubility and concentration were met, other consideration like the effect on non target organisms such as fishes and other amphibian inside the river has to be investigated before it can be declare a candidate molluscicide and this together with the isolation of the compounds responsible for activity will be the focus of future research.

It is interesting to note that in all cases of death, death occurs within 6 hours of application of the extracts to the snails with a reddish fluid around the snails which may suggest heamolysis of the blood and this gives noxious odor the following day.

It was also observed that both the extracts and the various fractions produced what can be call all or none response as efforts to get a concentration that will not give 100% mortality was not successful. This action of the extracts and fractions would be of immense utility if the plant is to be used in the control of the snails as it will be certain that if the appropriate concentration is used total eradication of the snails in the affected community will be accomplished and this will ensure that there will not be residual snails that can serve as intermediate hosts for further infection of humans.

CONCLUSIONS

This study has confirmed the ethno botanical use of the plant as a fish poison and as a potential molluscicidal agent which the people living in endemic areas can be encourage

to use the fruit pericarp after extracting the oil from the seed which can serve as additional source of income but such usage is subject to further research to determine its effect on other aquatic organisms and to isolate the agents responsible for actvity from the various fractions.

Effort is on to isolate the active compounds responsible for activity from various fractions.

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