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Antimicrobial and Cytotoxic Activities of the Crude Extracts of *Polyalthia Simiarum*

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Abstract

The extractives of *Polyalthia simiarum* (Annonaceae) were subjected to antimicrobial screening and brine shrimp lethality bioassay. In case of antimicrobial screening petroleum ether and ethyl acetate extracts exhibited promising antibacterial activity, while the petroleum ether extract demonstrated highest cytotoxicity with LC_{50} of 1.91 ug/ml in the brine shrimp lethality bioassay.

1. Introduction

Polyathia simiarum Hook. f. Thom. locally known as Arjan, (Family- Annonaceae) is a very tall tree which grows in Cox's Bazar hillside of Bangladesh. It is also grown in India, Bhutan, Mayanmer, Thailand , Laos and Vietnam.[1] The species of this genus are reported to have cytotoxic and antimicrobial,[2] anticancer[3] and antimalarial[4] activities. The species of this genus is used for the treatment of skin disease, fever, diabetes, hypertension and helminthasis.[5]As part of our studies of medicinal plants of Bangladesh, we herein, report the antimicrobial and cytotoxic activities of the crude extracts of *P. simiarum*.

ll. Materials and Methods

The stem bark of *P. simiarum* was collected from Mirpur, Dhaka in the month of June 2008 and identified by Mr. Sarder Nasir Uddin, Scientific Officer, Bangladesh National Herbarium, Dhaka, where a voucher specimen (DACB-34201) representing this collection has been deposited. The air dried powdered plant material (700 g) was sequentially extracted in a Soxhlet apparatus with petroleum ether (60-80^{O}C) followed by ethyl acetate. The extractives were filtered through fresh cotton plug and followed by whatman no.1 filter paper. The filtrate were then concentrated by a Buchii rotavapor at low temperature and pressure and afforded pet-ether extract (PE, 3.5g), ethyl acetate extract (EA, 2.5g). The antimicrobial activities of the crude extracts were determined by the disc diffusion method,[6,7,8] against the bacterial strains listed in Table-1. These were collected as pure cultures from the Institute of Nutrition and Food Science (INFS), University of Dhaka, Bangladesh. Here Kanamycin (30 µg/disc) was used as the standard. The pet-ether and ethyl acetate extracts were dissolved separately in chloroform and applied to sterile discs at a concentration of 400 µg/disc and carefully dried to evaporate the residual solvent.

Table. 1. Antimicrobial activity of *P.simiarum* extracts(400µg/disc) and kanamycin (30 µg/disc)

Test microorganisms	Diameter of zone of inhibition (mm)		
	PE	EA	KAN
Gram Positive			
Bacillus cereus	25	23	35
B. megaterium	28	27	38
B. subtilis	25	25	36
Staphylococcus aureus	24	23	35
Sarcina lutea	25	27	36
Gram Negative			
Escherichia coli	-	-	37
Pseudomonas aeruginosa	23	25	27
Salmonella paratyphi	23	25	36
S. typhi	20	21	35
Shigella boydii	24	25	36
Vibrio mimicus	21	23	37
V. parahemolyticus	21	21	35
Fungi			
Candida albicans	27	28	35
Aspergillus niger	25	25	35
Sacharomyces cerevacae	25	28	38

PE: Pet ether extract, EA: Ethyl acetate extract; KAN: kanamycin. The zone of inhibition less than 8 mm was considered inactive.

Table 2. LC_{50} data of *P. simiarum* extracts and vincristine sulfate.

Samples	LC_{50} µg/ml
VS.	0.32
PE	1.91
EA	3.65

The values of LC_{50} were expressed in µg/ml. VS: Vincristine Sulfate (Std); PE: Pet-ether extract; EA: Ethyl acetate extract. For cytotoxicity screening, DMSO solutions of the petroleum ether and ethyl acetate extracts were applied against *Artemia salina*[9] in one-day *in vivo* assay. For the experiment 4 mg of each of the pet-ether and ethyl acetate extracts were dissolved in DMSO and solutions of varying concentrations 400, 200,100, 50, 25, 12.50, 6.25, 3.125, 1.563, 0.781(µg/ml) were made by serial dilution technique for each extract.

Ill. Results and Discussions

The crude pet-ether and ethyl acetate extracts showed promising antibacterial activity with the average zone of inhibition of 20-28mm and 21-28mm, respectively, at 400µg/disc.The pet-ether extract showed the highest activity against the growth of *B. megaterium* having the zone of inhibition of 28mm. Besides the growth of *B. cereus*(25mm), *B. subtilis*(25mm), *S. lutea*(25mm), *S. boydii*(24mm), *S. aureus*(24mm), *P. aeruginasa*(23mm), *S.paratyphi*(23mm), *S. dysenteriae*(23mm) exhibited prominent activity. In the case of fungi, the average zone of inhibition was found to be 25-28mm. At the same time, the ethyl acetate extracts also inhibited the growth of *B.megaterium*(27mm), *S.lutea*(27mm), *B.subtilies*(25mm), *p. aeruginosa*(25mm), *S. paratyphi*(25mm), .b*oydii*(25mm), *S. dysenteriae*(25mm), *B. cereus*(23mm), *S. aureus*(23mm) and *V. mimicus*(23mm) significantly. The same extract also exhibited high inhibitory activity against the growth of fungal strains. Following the procedure of Meyer,[9] the lethality of the pet-ether (PE) and ethyl acetate (EA) extracts to brine shrimp were evaluated on *A. salina* after 24 hours[9] of exposure the sample and the positive control, Vincristine sulphate(VS). The LC_{50} were found to be 0.32, 1.91, 3.65 µg/ml for VS, PE and EA extracts respectively.The cytotoxicity exhibited by the crude extracts were promising and this clearly indicates the presence of potent bioactive compounds.

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