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Evaluation of Better Antimicrobial Activities amongst *Sapium sebiferum* and *Artocarpus heterophyllus*

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ABSTRACT

The present study was carried out to evaluate the phytochemicals and comparative antimicrobial activities of *Sapium sebiferum* and *Artocarpus heterophyllus*. Phytochemical screening of the *S. sebiferum* and *A. heterophyllus* showed the presence of carbohydrates, phenolic compounds and tannins. The comparative assessment of antifungal activity was performed in terms of percentage of radial growth on solid medium (potatoes dextrose agar) against *Aspergillus niger*. The antibacterial effect was studied by the agar direct contact method using *Bacillus cereus* and *E. coli*. The results revealed that the acetone extract of *Artocarpus heterophyllus* showed good antifungal activity against *Aspergillus niger* in comparison to the standard drug (Clotrimazole), while acetone extract of *Sapium sebiferum* showed no antifungal activity. Acetone extract of *Sapium sebiferum* showed good antibacterial activity against *B. cereus* (25mm) and *E. coli* (20 mm) inhibition zone. Whereas Acetone extract of *Artocarpus heterophyllus* showed less antibacterial activity i.e. zone of inhibition against *B. cereus* (10mm) and *E. coli* (9 mm). Both plant extracts have high medicinal value. These results suggest that traditional folk medicine could be used as a guide to our continuing search for new natural products with potential medicinal properties.

INTRODUCTION

Sapium sebiferum Roxb. is a plant belonging to family *Euphorbiaceae*.¹ It is monoecious, deciduous small tree up to 13 m tall, stem often gnarled bark whitish grey with vertical cracks, containing white latex. Leaves are alternate, broad rhombic to ovate in shape 3.8-8.5 cm long and have smooth edges, heart shaped. Its wood has been used to make various implements, toys, furniture inferior quality pencils, cricket bats and Chinese printing blocks.² Resin from root bark is considered as purgative. The seed is antidote, emetic and purgative.³

Artocarpus heterophyllus is a plant belonging to family *Moraceae*. It is a large, evergreen tree, 10-15 m in height, stem is straight rough whereas bark is green or black, 1.25cm thick, exuding milky latex⁴. Leaves are dark green, alternate, simple, glossy, large and elliptic to oval in form. Fruits are oblong cylindrical in shape. Its leaves are useful in fever, boils, wounds and skin diseases. The latex is useful in dysopia, ophthalmic disorders and pharyngitis and also used as antibacterial agent. The root is a remedy for skin diseases and asthma. The wood has a sedative property. Latex is used as an anti-inflammatory agent⁵.



MATERIALS AND METHODS

Collection and Identification of leaves of *Sapium sebiferum Roxb.* and *Artocarpus heterophyllus*

Leaves of *Sapium sebiferum Roxb.* and *Artocarpus heterophyllus* were collected from FRI, Dehradun and Manduwala Chakrata road, Dehradun respectively. Plant material was authenticated by S. K. Srivastava (Scientist D/HOD), in Botanical Survey of India, Northern regional centre, Dehradun (BSI).

Extraction of leaves of *Sapium sebiferum Roxb.* and *Artocarpus heterophyllus* in different solvents (Non-polar to Polar)

The collected plant Material was washed with water to remove other undesirable material and dried under shade. The air-dried leaves (200 gm) of both were crushed. The crushed leaves were extracted with different solvents of increasing polarity viz. Petroleum ether,

Chloroform, Acetone and Methanol by hot percolation method using Soxhlet apparatus. The extract was evaporated till dryness to obtain residue. These extracts were concentrated under reduced pressure. The extract was used for antimicrobial activity.

Antimicrobial activity of different extracts:

The antimicrobial activity of the leaves of *Sapium sebiferum Roxb.* and *Artocarpus heterophyllus* was carried out. The leaves extract were screened for antibacterial and antifungal activities.

Anti-bacterial activity of leaves extract:

In present study, the anti-bacterial activity was studied against the microorganism and the bacterial cultures used in the study were:

1. *B. cerus*
2. *B. pumilus*
3. *M. luteus*
4. *Escherichia coli*



These bacterial cultures were maintained on nutrient agar slants at first being incubated at 37°C for about 18-24 hours and then stored at 4°C as stock for antibacterial activity. Fresh cultures were obtained by transferring a loop full of cultures into nutrient broth and then incubated at 37°C overnight. To test antibacterial activity, the well diffusion method used.

Culture media preparation:

The microbiological media prepared as standard instruction provided by the HI-Media Laboratories, Mumbai. The media used for anti-bacterial activity Muller- Hinton Agar (MHA) and Nutrient broth (NB). They were prepared and sterilized at 121°C at 15 psi for 15-30 minutes autoclave.

Plate preparations:

25 ml of pre autoclaved Muller-Hinton agar (MHA) was poured into 90 mm diameter pre sterilized petri-plates. These petri-plates were allowed to solidify at room temperature.

Well diffusion method

After the plated solidified the freshly prepared microbial growth culture suspension (about 20 μ l) was spread over the Muller – Hinton agar (MHA) media using L shaped sterilized glass spreader separately under the aseptic condition using laminar air flow. Then well were made in each plate with the help of borer of 8 mm diameter. In these well, about 100 μ l of each leaves extracts individually was loaded. This method depends upon the diffusion of leaves extracts from hole through the solidified agar layer of petri-dish to such an extent that the growth of added microorganism is prevented entirely in a circular area or Zone around the hole containing leaf extract.

Incubation: Petri plates were incubated for overnight at $37^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$ in the incubator.

Measurement of zone of inhibition

After incubation, the diameter of clear zone of incubation produced around the well or holes were measured in mm by ESR Tube and compared with standard drug.

RESULTS

Table-1: Antibacterial activity of different extracts of *Sapium sebiferum Roxb.* and standard drug chloramphenicol

Sr. No.	Test organism	Inhibition zone in mm						
		Pet. ether	Chlorof orm	Acetone	Methanol	Standard drug		
						Ampicillin	Streptomy cin	Chloram - phenicol
1	<i>E. coli</i>	10	20	20	-	20	17	25
2	<i>B. cereus</i>	18	16	25	-	15	16	36
3	<i>B. pumilus</i>	-	20	25	22	-	16	20
4.	<i>M. luteus</i>	-	10	14	16	30	26	30

Table- 2: Antifungal activity of different extract *Sapium sebiferum Roxb.* and standard drug Clotrimazole

Sr. No.	Test Organism	Inhibition zone in mm					Standard drug Clotrimazole
		Pet. Ether	Chloroform	Acetone	Methanol		
1	<i>A. niger</i>	-	-	-	-	11	
2	<i>M. gypseum</i>	18	14	20	-	-	
3	<i>T. flavurus clem</i>	12	12	22	-	12	

Table-3: Antibacterial activity of different extracts of *Artocarpus heterophyllus* and standard drugs

Sr. No.	Test organism	Inhibition zone in mm						
		Pet. ether	Chloroform	Acetone	Methanol	Standard drug		
						Ampicillin	Streptomycin	Chloram- phenicol
1	<i>E. coli</i>	1	-	9	19	20	18	20
2	<i>P. aeruginosa</i>	4	7	16	17	-	18	18
3	<i>B. cereus</i>	8	10	10	14	16	17	18
4.	<i>M. aureus</i>	-	-	7	8	24	27	15

Table- 4: Antifungal activity of different extract *Artocarpus heterophyllus* and standard drug Clotrimazole

Sr. No.	Test Organism	Pet. ether	Inhibition zone in mm				
			Chloroform	Acetone	Methanol	Standard drug	
						Amphotericin-B	Clotrimazole
1	<i>A.niger</i>	13	–	29	11	–	19
2	<i>C.albicans</i>	9	12	13	13	13	11
3	<i>S. clorotium</i>	6	-	13	7	–	-
4	<i>Rhizopus</i>	9	-	16	11	-	-
5	<i>Microsporium</i>	6	4	18	13	-	-

DISCUSSION

The antibacterial activity of leaves extracts of *Sapium sebiferum* was found active against *E.coli*, *Bacillus cereus*, *B. pumilus* and *M. luteus* chloroform and acetone extracts whereas leaves extracts of Pet. ether was found inactive against *B. pumilus* and *M. luteus*. The antifungal activity of leaves extracts of acetone was found highly active against *M. gypseum* and *T. flavuruscleum* while inactive against *Aspergillus niger*. The results revealed that the Acetone extract of *Sapium sebiferum* has shown more degree of anti-microbial activity than another extract when compared to the standard drug. It is due to presence of chemical constituents like alkaloids, proteins, carbohydrates, phenolic compounds, tannins, amino acid, fats and fixed oil and saponins which were confirmed by phytochemical studies. While in case of *Artocarpus heterophyllus* the methanolic extract showed good antibacterial activity against *B. cereus* and *Pseudomonas aeruginosa* and acetone extract showed good antifungal activity against *Rhizopus*, *Microsporium*, and *Aspergillus niger* in comparison to the standard drug.

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