

ORIGINAL ARTICLE

EVALUATION OF ANTIMICROBIAL ACTIVITY OF SYZYGIUM CUMINI
(JAMUN) IN VITRO: A PILOT STUDY

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ABSTRACT

BACKGROUND: Dental plaque is considered as major causative factor for progression of periodontitis. For this, various chemical agents have been practiced. Due to its long term usage it results in adverse reactions. To minimize its adverse side effects, treatment modalities have been changing towards herbal medications. Therefore, with minimal side effects, effectiveness of *Syzygium cumini* (jamun) against dental calculus formation is considered as vital.

MATERIALS AND METHODS: Dental calculus samples were cultured using brain heart infusion reagent. For antibiotic assay, Kirby – Bauer antimicrobial susceptibility procedure was carried. Freshly prepared jamun extract and chlorhexidine was kept in cultured agar plate, after 24hrs of incubation, inhibition zones was calculated.

RESULTS: Greater inhibition zones were seen around jamun extract compared to chlorhexidine.

INTRODUCTION:

Dental plaque is considered as major causative factor for progression of periodontitis.^{1,2} For this, various chemical agents have been practiced. Due to its long term usage it results in adverse reactions. To minimize its adverse side effects, treatment modalities have been changing towards herbal medications.³ Therefore, with minimal side effects, effectiveness of *Syzygium cumini* (jamun) against dental plaque formation is considered as vital. For the maintenance of oral health herbs are used since the dawn of human civilization.⁴ It symbolizes safety in contrast to synthetic products.

Herbal extracts have been successfully used in dentistry as antimicrobial agents. Though herbs are used for centuries, in the last few decades the interest in the research of medicinal plants was enormous. One such fruit is jamun also called as *Syzygium cumini* (family- Myrtaceae). All the parts of this tree especially its seed are of important medicinal value. The plant has been reported to possess antioxidant and free radical scavenging activities⁵, antibacterial⁶, antifungal⁷, antidiabetic⁸ and anti-inflammatory activities⁹. The main purpose of the present study is to analyze the antimicrobial activity of jamun seed against dental plaque.

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AIMS AND OBJECTIVES:

1. To analyze the antimicrobial activity of jamun using plaque samples.
2. To identify the higher efficacy between different extracts of jamun seed.
3. To compare the efficacy with chlorhexidene.

MATERIALS & METHODS:

SAMPLE COLLECTION:

Sample size-10

After obtaining Ethical clearance 10 patients with chronic periodontitis presented to the dept. of periodontology, Vivekanandha dental college were randomly recruited for the study. Each individual was informed about the study protocol and written informed consent was obtained from all patients.

From the enrolled patients, after completely drying the maxillary molar region with gauze, 10 subgingival plaque samples were collected using scalers. The collected samples were stored in the culture bottles.

SAMPLE CULTURE:

Collected samples were inoculated into brain heart infusion reagent and incubated at 37°C for 48 h. After 48 h, colonies of microbial growth were noted.

CULTURE MEDIA PREPARATION:

Muller- hinton agar is mixed with agar-agar by frequent agitation to dissolve the components. Then autoclaved at 121°C for 15 min, cooled to 45°C. Agar is poured into petri dishes which is then solidified at room temperature and stored at 4°C.

JAMUN EXTRACT PREPARATION:

The infusion extraction method given by Houghton and Raman was used. [10] After the collection, jamun seeds were ground in a blender. 50g of jamun seed is mixed with

200ml of 3 different extracts. 1.acetone, 2.methanol and 3.diethyl ether. Occasionally stirred, then filtered using microspore filter paper & extracts were collected in test tube and dried at room temperature and finally stored in refrigerator (4°C) until further use.

CHLORHEXIDINE:

Chlorhexidine is gold standard one, against which other antiplaque and antigingivitis agents are measured. Chlorhexidine (CHX) in the form of mouthwash which is most commonly prescribed. It was said to have long-lasting antibacterial activity with a broad-spectrum of action. In this study commercially available mouthwash was taken as control.

ANTIBIOTIC ASSAY:

KIRBY-BAUER ANTIMICROBIAL SUSCEPTIBILITY TEST PROCEDURE:

The cultured bacteria were streaked on the already prepared muller-hinton culture media using cotton swab. Following incubation, the plates are examined for the presence of growth inhibition, which is indicated by a clear zone surrounding each disk. The susceptibility of an organism to a drug is determined by the size of the zone. A measurement of diameter of the zone of inhibition in millimetres is made and its size is compared.¹¹

DISC PREPARATION:

The extracts were transferred into discs. Then the discs are placed on the culture media. All plates were incubated in an inverted position for 24-48 h at 37°C. Antimicrobial activity of jamun seed is assessed in 3 extracts of jamun seed, chlorhexidene and empty well. Results were evaluated and compared.

RESULTS:

After 24hrs of incubation results was assessed. Inhibition zones formed over the agar plates were measured using millimeter scale which looks circular in shape

1. There was an inhibition zone of 7mm diameter around control well chlorhexidine (C).
2. There was a wide inhibition zone of about 9mm diameter around diethyl ether (D), 8mm inhibition zone around methanol (M) and 6mm around acetone (A).

DISCUSSION:

The zone of inhibition was greater than the chlorhexidine in diethyl ether group which shows definitive anti-microbial activity of *S.cumini*. The use of the 3 different extraction methods gives knowledge about the phytochemical activity of jamun seed for different chemical agents.

The formation of wide inhibition zone around diethyl ether than the methanol and acetone indicates that the higher release of medicinally active substances from the jamun seed when it combines with diethyl ether.

In this study the result was compared with the gold standard mouthwash chlorhexidine as a control, that is proven to have the bactericidal and bacteriostatic activities.¹²

The antibacterial activity of *S.cumini* is due to the presence of monoterpene aldehydes which inhibit the protease activity and produce bactericidal effect on oral pathogens.

Other phytochemicals such as anthocyanins, alkaloids, carotenoids, flavonoids, polyphenols and tannins also have the antibacterial properties that are effective against oral microbes.¹³

Ethyl acetate, petroleum ether and methanolic extracts of the SC leaf were found to be effective against *Salmonella typhimurium*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Enterobacter aerogenes*.

Acetone, aqueous and ethanolic bark extracts were evaluated for their antibacterial effects against twelve strains of *Vibrio cholera*, of which the ethanolic extract was found to be most effective.

Aqueous leaf extract of SC has shown beneficial effects against *Klebsiella* sp., *Salmonella paratyphi*, *Citrobacter* sp., *E. coli*, *Staph. aureus*, *Shigella sonnei*, *Pseudomonas aeruginosa*, *Salmonella typhimurium*, *Shigella boydii*, *Strep. faecalis*, *Shigella flexneri* and *Salmonella typhi*.¹⁴

In this study the formation of inhibition zone on the agar plates ensures the definitive antimicrobial activity of *Syzygium cumini*. Within the selected extract chemicals, the diethyl ether gives better antimicrobial activity with the average inhibition zone of 9 mm. Hence it is proved that the the jamun seed can be used to prevent the periodontal disease progression.

CONCLUSION:

Thus the study helps us to understand that jamun seed have a great potential for antibacterial action. The study shows definitive antimicrobial effect of jamun extract. Since it is herbal it will overcome the disadvantages of chlorhexidine. In future studies will be focused on formulating the jamun extract as an anti-plaque agent.

Fig 1: Zone of inhibition around discs:

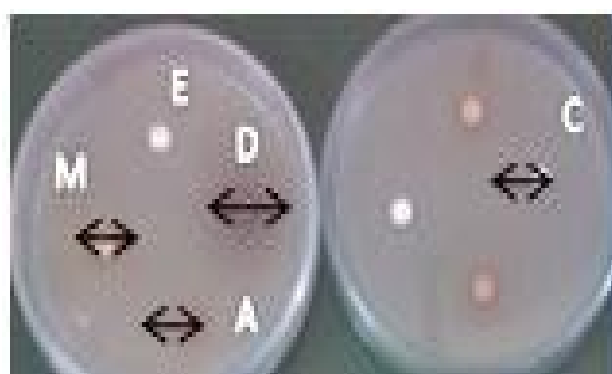


TABLE:

Zone of inhibition of all the samples: (mm)

Sample	Diethyl ether	Methanol	Acetone	Chlorhexidene	Empty
1.	10	9.1	7.8	8	0
2.	9.8	7.7	6.3	9.1	0
3.	6.5	5.8	5.5	5.5	0
4.	7	6.7	4.3	5.4	0
5.	9.7	9.5	6	8.7	0
6.	8.9	8.5	5.6	8	0
7.	10.6	10.1	9	8.9	0
8.	9.2	8.8	7.4	6.7	0
9.	9.6	8	5	6	0
10.	8.4	8.1	6.8	7.8	0
AVERAGE	8.9	8.1	6.3	7.4	0

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