To Assess the Antimicrobial Efficacy of Mimosa Pudica (Laajvanti) Plant against Oral Micro-Organisms –An in Vitro Study

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Abstract: Introduction: Dental caries and periodontitis are common oral infections. Many antibiotics are resistant to common oral infections. Flavanoids are known to be synthesized by plants such as Mimosa Pudica in response to microbial infection. Methodology: The extract of mimosa pudica plant were tested against s. mutans and fusobacterium nucleatum by agar well method. Result: In our study there was no zone of inhibition found against the microbes which may have occurred due to methodological fallices. Conclusion: Mimosa pudica if found effective against oral microbes has emmense potential as a therapeutic agent in oral products.

Keywords: S. mutans, Fusobacterium nucleatum, Mimosa, Antimicrobial, Flavinoids

Introduction: Dental caries: It is a local transmissible infection of teeth which results from interaction of teeth with carbohydrate, modified diet, microorganisms and saliva. Acid is formed and there is drop in plaque pH from 7 to 4.5 thus mineral components of tooth $Ca(OH)_2$, hydroxyapetite crystals and fluorapatite crystals all are demineralized for the compensation of reduced pH thus forming a cavity.[1]

Periodontitis: It affects the periodontium such as gingiva, periodontal ligament, cementum and alveolar bone. Almost 90% of population is affected by periodontitis in India. Periodontitis is a debilitating condition as pain, discomfort and general malaise are the associated features.[2]

Flavanoids are known to be synthesized by plants such as Mimosa Pudica in response to microbial infection. Tannins are water soluble polyphenols and have been reported to prevent the development of microorganisms by precipitating microbial proteins. [3]

Background, Properties and Chemical Composition of Mimosa Pudica:

Mimosa Pudica: It belongs to the family Mimosaceae. Roots of the plant are indicative of the presence of flavonoids, phytosterol, alkaloids, amino acids, tannins, glycoside, and fatty acids. [4]

As Lazaoni, root decoction is gargled for gum trouble and toothache by Rahba in West Bengal. In Orissa (Kandhamal district) as Lajakulilata, the paste of root fried in ghee is applied on caries teeth for relief from toothache. An alkaloid mimosine has been isolated from the plant. The leaves of Mimosa pudica plant is widely used in Ahmednagar District of India for oral disease cure. Decoction of root of Mimosa pudica is used with water to gargle to reduce toothache. [4]

Literature shows evidence of its use for dental decay, bleeding gums throughout India & worldwide but few studies are done to check its efficacy as an oral antimicrobial. The aim of the study is to assess antimicrobial efficacy of Mimosa Pudica plant (whole plant extract) against oral microorganisms.

Fig 1. Mimosa Pudica Plant

Material & Methods:

1. Oral Microorganisms Strains

Table I

Sr. No.	Oral Disease	Microorganism strain
1	Dental Caries	Streptococcus Mutans
2.	Periodontitis	Fusobacterium Nucleatum

2. Chlorhexidine 0.2% as positive control,
3. Mimosa Pudica Whole Plant
4. Nutrient broth & Agar Media
5. Test-tubes & Petri dishes
6. Soxhlet extractor
7. Incubator
8. Whatsman No.4 Filter paper
9. Rotary evaporator
10. Oven

Methodology: Antimicrobial activity of the extracts of M. pudica plant in ethanol will be studied against various Gram positive and Gram negative bacterial strains using the zone of inhibition. Further Minimum Inhibitory Concentration will be studied.

Preparation of Extract:
Plant specimen for the proposed study will be collected from local plant nursery and identified by botanical experts. Ethanolic extract will be prepared using Soxhlet extractor.

Table Ii: Mimosa Pudica Will Be Tested For Each Microorganism As Shown In Table

Culture Revival: Ampules of freezed and dried forms of oral micro organisms will be obtained from MTCC / ATCC. The culture will be revived by adding ampule contents in nutrient broth and incubated for 24 hours at 37° C or as per the details given.

Efficacy Testing By Agar Well Method:
Agar Culture media will be prepared according to manufacturers instruction. The growth obtained will be transferred to Agar plates by streaking method. 4 wells will be made in agar plates using well borer. 3 wells will be filled with 10 µl of 5%, 10% & 20% each of ethanolic extracts using micropippetes. One well will be filled with 0.2% chlorhexidine as positive control. Plates will be kept in incubator at 37°C for 48 hours. Zone of inhibition will be measured after 48 hours which will be an indicator of antimicrobial efficacy of M. Pudica.

Result:

Figure 1. Antimicrobial Efficacy of Mimosa Pudica against Fusobacterium Nucleatum

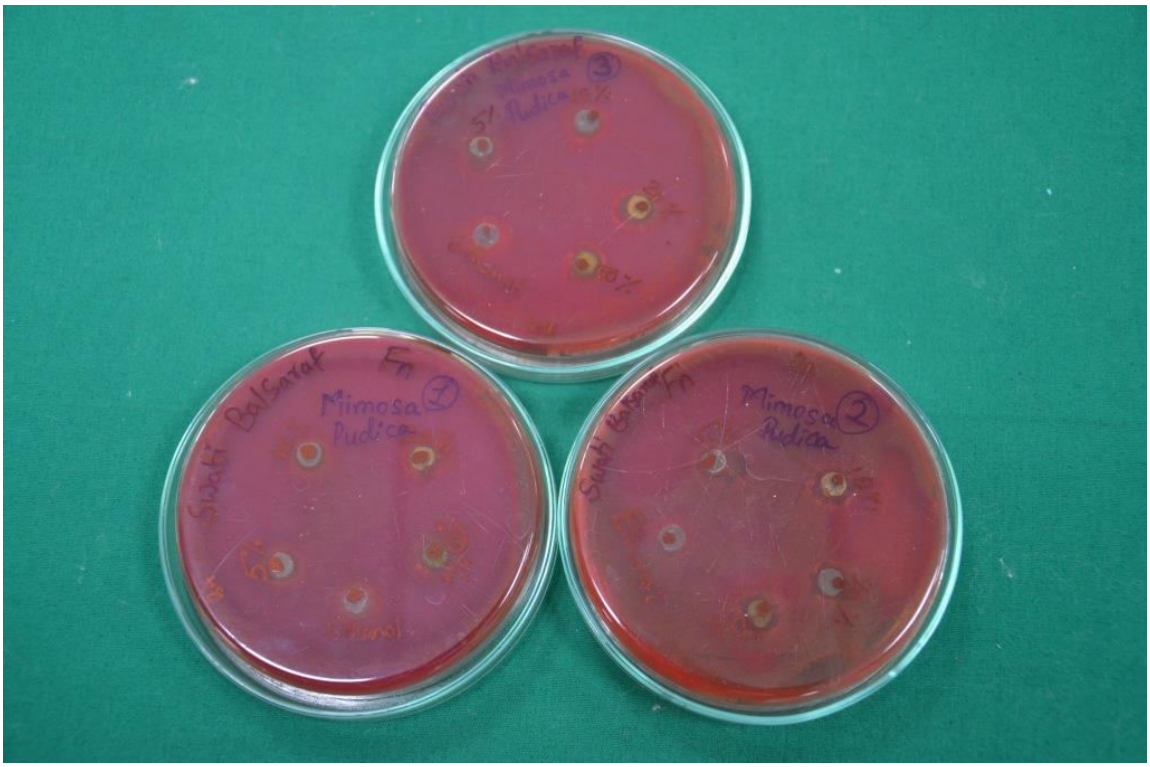
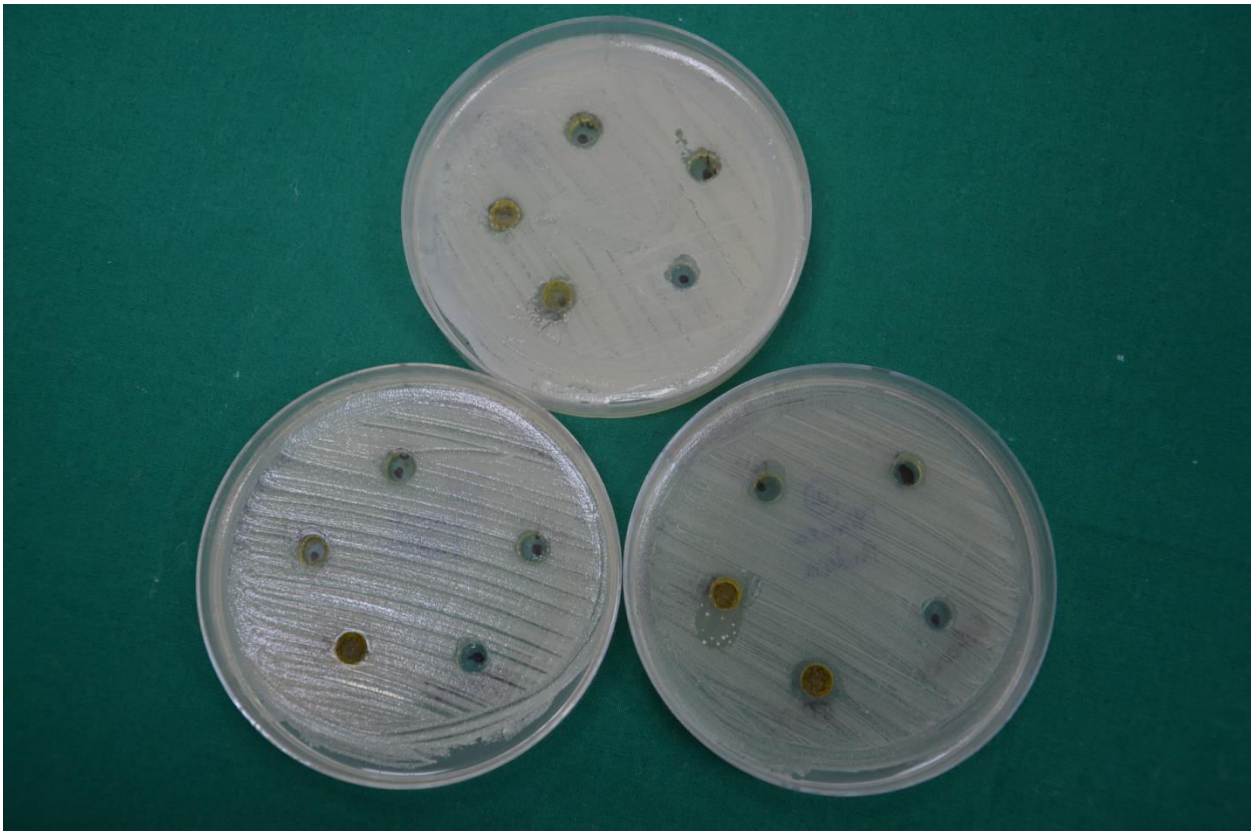


Figure 2. Antimicrobial Efficacy of Mimosa Pudica against Streptococcus Mutans



We found in our study almost no growth of micro-organisms on the whole plate. This could have happened as a result of firstly, improper growth of micro organisms (less turbidity than required). Secondly, while transferring the micro organisms from the broth to agar media, the inoculation loop being too hot could have killed the micro-organisms taken for streaking. Thirdly as the whole procedure is done under the UV radiations overexposure of open petri dishes to the light after streaking must have killed the micro organisms thus giving no chance for growth. While preparing agar the pH required for growth must not have met the standards thus, there could have been flaws in measuring materials while preparing the agar. As compared to other microorganisms it is difficult to revive streptococcus mutans as it is very selective in nature.

Outcome of Study: The antimicrobial property of Mimosa Pudica is attributed to the various phytochemicals such as alkaloids, flavanoids, tannins, phenolic compounds, glycosides, terpenoids, quinines, saponins, and coumarins Mimosa Pudica if shown effective can be used as an ingredient in mouthwashes as a bacteriostatic agent which will help reduce inflammation and progress of gingival, periodontal disease and carious lesions.

Discussion:

Phytochemical analysis of these plants revealed presence of tannins, alkaloids, flavanoids, terpenoids and glycosides.[4]Mimosa pudica has been reported to contain mimosine (an alkaloid), free amino acids, sitosterol, linoleic acid & oleic acid.[5]

In a study done by Salve AP 2012 it was found that the leaves of Mimosa pudica plant is widely used in Ahmednagar District. Aproximately 2-3 gm of leaf powder is mixed in equal amount of Gondhan (Cordia Ghraf) stem bark powder with a pinch of common salt is boiled in a glass of water and the decoction is gargled for relieving pain in gum & teeth.[6] In an another study done by Joshi K and Joshi AR decoction of root of Mimosa Pudica is used with water to gargle to reduce toothache among the local people of the Kali Gandaki and Bagmati watersheds of Nepal.[7]

Gandhiraja N et al studied the antimicrobial activity of Mimosa pudica against microorganisms. The maximum zone of inhibition was obtained for Aspergillus fumigatus and Klebsiella pneumonia at a concentration of 00µg/200µl. While Klebsiella pneumonia exhibited good sensitivity against both the concentrations, Citrobacter divergens showed resistance against Mimosa pudica extract at all concentrations.[8] Paula JSD et al 2012 in Germany found that Mimosa Pudica was one of the common herb which was used for pain and inflammation.[9]In a study done by Bora A 2012 in Assam it was reported that the paste of Rhizome part of Mimosa pudica (Nilagibon) is applied locally to treat toothache.[8]Akhtar A 2010 found in ethanol extract of M. pudica, the highest and lowest zone of inhibition was 13.40 mm (MIC, 312.5 µg/ml) and 9.35 mm (MIC, 625 µg/ml) against P. aeruginosa and B. cereus, respectively. On the other hand, for petroleum ether and chloroform extract the corresponding highest zone of inhibition was observed 15.30 and 12.40 mm in B. subtilis with MIC value 156.25 µg/ml.[10]

Decoction of root is used with water to gargle to reduce toothache. The antimicrobial activity of mimosa was studied using well diffusion method. Aqueous extract of stem bark, methanolic extract of leaves, and seed have antimicrobial activity .The activity was tested against Aspergillus fumigatus, citrobacter divergens and Klebsiella pneumonia at different concentrations of 50, 100 and 200µg/disc. Also the leaf extract show strong antimicrobial activity against Staphylococcus aureus and Bacillus subtilis. Successive extracts of the whole plant are reported to have antibacterial activity.

Conclusion: As Mimosa Pudica has shown dental therapeutic effects it's efficacy and potential as anticaries and use for other dental uses should be explored. The properties thus cannot be discussed at length and thus opens new channels for research and makes it a potential drug for dental treatment. With the advance in time oral microorganisms will get resistant to the current medicines and hence mimosa Pudica can be considered as

a potential medicine used in mouthwashes, intracanal medicaments unless proved as there is very little research done for its dental uses.

References:

1. N.O Harris. Primary Preventive Dentistry. 7th Edition: Pearson Publisher; 2009.
2. Parameters on acute periodontal disease., J. Periodontol 2000;71:863- 866,856-858.
3. Kumarasamyraja D, Jeganathan NS, Manavalan RA. Review on medicinal plants with potential wound healing activity Int J Pharm Sci. 2012;2:105–11.
4. Salve AP. Traditional oral healthcare practices in pathardi areas of Ahmednagar District, Maharashtra, India Bull Environ Pharm Life Sci. 2012;7:84–8.
5. Joshi K, Joshi AR. Ethnobotanical plants used for dental and oral healthcare in the kali gandaki and bagmati watersheds, Nepal Ethnobot Leaflets. 2006; 10:174–8.
6. Gandhiraja N, Sriram S, Meenaa V, Srilakshmi JK, Sasikumar C, Rajeswari R, et al Phytochemical screening and antimicrobial activity of the plant extracts of Mimosa pudica L. against selected microbes Ethnobot Leaflets. 2009; 13: 618–24.
7. Srivastava V, Sharma A, Alam I. A review on ethnomedical and traditional uses of mimosa pudica (Chui-Mui) Int Res J Pharm. 2012:3.
8. Muthukumaran P, Padmapriya P, Salomi S, Umamaheshwari R, Kalaiarasan P, Malarvizhi C. In vitro antimicrobial activity of leaf powder Asian J Pharm Res. 2011; 1:108–109.
9. Bora A, Devi P, Borthakur SK. Traditional practice for dental hygiene and hazard by common people: A case study in Majuli, Assam J Nat Prod Plant Resour. 2012;2:221.
10. Arokiyaraj S, Sripriya N, Bhagya R, Radhika B, Prameela L, Udayaprakash NK. Phytochemical screening, antibacterial and free radical scavenging effects of Artemisia nilagirica, Mimosa pudica and Clerodendrum siphonanthus - An in-vitro study Asian Pac J Trop Biomed. 2012;2:S601–4