

Review Article

Available Phytomedicines Used Against *Streptococcus Mutans*

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Abstract: One of the main bacteria for caries formation is *Streptococcus mutans*. It is gram-positive cocci, encapsulated and produces acid which is responsible for tooth decay. Medicinal plants are found to be beneficial for treatment and prevention of various diseases from ancient times. The present review focuses on various common medicinal plants available for the prevention and treatment of tooth decay caused by *Streptococcus mutans*.

Keywords: *Streptococcus mutans*, Phytomedicines, Antibacterial effect.

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INTRODUCTION

Oral cavity is one of the most complex parts of the human body that consists of hard and soft tissues and harbors a variety of microbial community which makes it vulnerable to infectious diseases (Potentials of mouthwashes in disinfecting cariogenic bacteria and biofilms leading to inhibition of caries). One of the most common infectious diseases of the oral cavity is dental caries, which has multi-factorial etiology such as diet, micro flora, host and time. It has been demonstrated that micro-organisms are one of the major etiological factors (Sundas, S., & Rao, A. (2011). Amongst the pathogenic flora *Streptococcus mutans* is considered to be the main microorganism associated with dental caries. *Streptococcus mutans* is gram-positive, encapsulated, acid producing cocci that cause destruction to the structural integrity of a tooth. If *Streptococcus mutans* population exceeds 50% of the total population of bacteria, tooth decay may occur (Kreth, J. *et al.*, 2009). *Streptococcus mutans* clings to the tooth surface by producing sticky glucan polymers from sucrose via glucosyl transferase (Murray, J. J. *et al.*, 2003). Dental caries is considered to be a preventable disease which can be prevented by suppressing any one of the factors of the Keyes triad (Figure 1). The preventive measures include reducing the counts of cariogenic flora in the oral cavity.

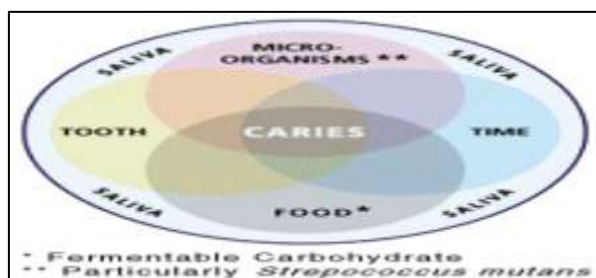


Figure 1: Keyes Triad of Caries Formation

According to ancient history, medicinal plants play an important role for the prevention and treatment of various human diseases. Due to antibiotic resistance and use of

conventional drugs become a burning question of safety issues now a day, researchers found a suitable alternative to the synthetic drugs in the form of natural medicines. This present study reviews the antibacterial effect of commonly available medicinal plants that are used against *Streptococcus mutans*.

DISCUSSION

There Are 12 Commonly Available Medicinal Plants Which Are Used For Their Antimicrobial Effect Against *Streptococcus Mutans*. These Are:

1. *Syzygium aromaticum* (Labango in Bengali):

It is commonly known as Clove. Its flower bud is used against *Streptococcus mutans* (DMST18777). It is proved that the ethanol extract inhibits the bacterial growth at a concentration of 20µg / ml with inhibition zone diameter of 14 mm and Minimum Inhibitory Concentration (MIC < 12.5µg / ml) and Minimum Bactericidal Concentration (MBC = 50µg / ml) proved. However, the inhibition zone diameter of 15µg / ml erythromycin was 40 mm (Chaiya, A. *et al.*, 2013).

2. *Cinnamomum cassia* (Daruchini in Bengali):

It is commonly known as Chinese Cinnamon. Its bark is the main part which works against *Streptococcus mutans*. The inhibition zone diameter of the plant was respectively 29, 27.15, 18, 19, 32, 19, 27 and 15 for the corresponding bacteria (Chaudhry, N. M. A., & Tariq, P. (2006).

3. *Terminalia chebula* (Haritaki in Bengali):

It is commonly known as Chebulic Myrobalan and the fruit is very effective against human dental *Streptococcus mutans*. Diameter of inhibition zone induced by ethyl acetate extract (5 and 2.5 mg/discs) of the plant was 16 mm and 14 mm, respectively. Minimum Inhibitory Concentration of less than 0.076 (MIC < 0.076 mg / mL) was reported (Jebashree, H. S. *et al.*, 2011).

4. Psidium guajava(Peyara in Bengali):

The known name is Common Guava and its leaf is an important part which is effective against human dental *Streptococcus mutans*. Diameter of inhibition zone induced by ethyl acetate extract (5 and 2.5 mg/discs) of the plant was 20 mm and 18 mm, respectively. Minimum Inhibitory Concentration of less than 0.076 (MIC <0.076 mg / mL) was reported (Jebashree, H. S. *et al.*, 2011).

5. Mimusops elengi(Bakul in Bengali):

Commonly known as Elengi, Indian Medlar. Stick from this plant plays a vital role against human dental *Streptococcus mutans*. Diameter of inhibition zone induced by ethyl acetate extract (5 and 2.5 mg/discs) of the plant was 16 mm and 14 mm respectively (Jebashree, H. S. *et al.*, 2011).

6. Terminalia bellirica(Bahera in Bengali):

It is commonly known as Belleric Myrobalan and the fruit is effective against *Streptococcus mutans* (DMST18777). It is proved that the ethanol extract inhibits the bacterial growth at a concentration of 20µg / ml with inhibition zone diameter of 10 mm and Minimum Inhibitory Concentration (MIC<12.5µg / ml) and Minimum Bactericidal Concentration (MBC = 25µg / ml). However, the inhibition zone diameter of 15µg / ml erythromycin was 40 mm (Chaiya, A. *et al.*, 2013).

7. Glycyrrhiza glabra(Joshti Madhu in Bengali):

It is commonly known as Licorice and its rhizome is effective against *Streptococcus mutans* (DMST18777). It is proved that the ethanol extract inhibits the bacterial growth at a concentration of 20µg / ml with inhibition zone diameter of 15 mm and Minimum Inhibitory Concentration (MIC<12.5µg / ml) and Minimum Bactericidal Concentration (MBC = 25µg / ml). However, the inhibition zone diameter of 15µg / ml erythromycin was 40 mm (Chaiya, A. *et al.*, 2013).

8. Spilanthes calva(Marhati-tiga in Bengali):

It has a distinctive name which is "Toothache Plant" and its floral parts are used for the reduction of clinical isolates of *Streptococcus mutans*. Antibacterial property of aqueous extract of this plant was proved with the inhibition zone diameter of 11.6 mm. However, the inhibition zone diameter of following antibiotic controls was as follows: ampicillin (10 mm), nalidixic acid (11 mm), nitrofurantoin (10.6 mm) and tetracycline (10 mm) (Pathak, A. *et al.*, 2012).

9. Azadirachta indica(Neem in Bengali):

Its common names are Indian Lilac, Neem Tree. Its foliage has antibacterial effect against clinical isolates of *Streptococcus mutans*. Antibacterial property of aqueous extract of this plant was proved with the inhibition zone diameter of 11.6 mm. However, the inhibition zone diameter of following antibiotic controls was as follows: ampicillin (10 mm), gentamicin (12.3 mm), carbenicillin (13 mm), nalidixic acid (11 mm), nitrofurantoin (10.6 mm) and tetracycline (10 mm) (Pathak, A. *et al.*, 2012).

10. Emblica officinalis(Amlaki in Bengali):

It is commonly known as Emblic Gooseberry, Indian Gooseberry and its foliage is effective against clinical isolates of *Streptococcus mutans*. Antibacterial property of aqueous extract of this plant was proved with the inhibition zone diameter of 29.6 mm. However, the inhibition zone diameter of following antibiotic controls was as follows: ampicillin (10 mm), gentamicin (12.3 mm), carbenicillin (13 mm), nalidixic acid (11 mm), nitrofurantoin (10.6 mm) and tetracycline (10 mm) (Pathak, A. *et al.*, 2012).

11. Syzygium cumini(Kalo Jaam in Bengali):

Other known names for this are Java Plum, Black Plum, Jamun. Its foliage is effective against clinical isolates of *Streptococcus mutans*. Antibacterial property of aqueous extract

of this plant was proved with the inhibition zone diameter of 26.3 mm. However, the inhibition zone diameter of following antibiotic controls was as follows: ampicillin (10 mm), gentamicin (12.3 mm), carbenicillin (13 mm), nalidixic acid (11 mm), nitrofurantoin (10.6 mm) and tetracycline (10 mm) (Pathak, A. *et al.*, 2012).

12. Acacia nilotica(Babul Tree in Bengali):

It is commonly known as Gum Arabic Tree. Its foliage is effective against clinical isolates of *Streptococcus mutans*. Antibacterial property of aqueous extract of this plant was proved with the inhibition zone diameter of 19.3 mm. However, the inhibition zone diameter of following antibiotic controls was as follows: ampicillin (10 mm), gentamicin (12.3 mm), carbenicillin (13 mm), nalidixic acid (11 mm), nitrofurantoin (10.6 mm) and tetracycline (10 mm) (Pathak, A. *et al.*, 2012).

CONCLUSION

Now a day, chemotherapeutic measures are failing to fulfill the treatment protocols because of growing resistance to antibiotics and profound side effects. According to recent researches, medicinal plants could be a better alternative to synthetic drugs because these plants contain bioactive substances and antioxidants which have promising antibacterial activities and other effects. As day by day bacterial diseases are expanding and the drug resistance is posing major draw backs, it is high time to introduce medicinal plants to the society. The extracts of some medicinal plants, e.g. *Glycyrrhiza glabra* in particular showed fast bactericidal impact on *Streptococcus mutans* at 50 µg/ml of extract, in 2 minutes (Hwang, J. K. *et al.*, 2004). The mechanism of actions of these plants are still unknown but phenolic compound of this plants have shown antibacterial activities. More studies should be conducted on these commonly available medicinal plants so that the proper constituents along with their antibacterial effects could be known in near future in brief (Delfani, S. *et al.*, 2017).

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