



## Review Article

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### ROLE OF POMEGRANATE IN PREVENTIVE DENTISTRY

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#### ABSTRACT

The aim of this article is to review the role of pomegranate as a potential anti-plaque agent. The main functional value of pomegranate in oral health is in its polyphenolic flavonoid content. The available literature suggests the use of pomegranate extract in the prevention of dental caries and gingival inflammation, though *in-vivo* evidence is scarce. In India, pomegranate phytotherapy has the potential to provide cost-effective and an indigenous solution in preventive dentistry.

**Keywords:** Anti-plaque, Oral health, Pomegranate, Preventive dentistry.

#### INTRODUCTION

The name "pomegranate" derives from the Latin word "*pōmum*" meaning "apple" and "*grānātus*" meaning "seeded". The pomegranate (*Punica granatum*) is actually a fruit-bearing small tree, the fruit of which is called as the pomegranate fruit. India is one of the largest pomegranate producers. Pomegranate (Beejpur in Sanskrit) means "with many seeds" symbolizing prosperity and fertility. In ayurveda the root, bark, flowers, fruit and leaves of pomegranate has been extensively used for medicinal purposes. The names of different types of pomegranate produced in India are Ganesh, Phule Arakta, Mridula, & Bhagwa. Pomegranate fruit has been the centre of recent research because of its functional and medicinal effects apart from its nutritional value. These properties are because of its phytochemical contents which act as antioxidant, anti-tumour, anti-hepatotoxic, antimicrobial, anti-inflammatory, and antiviral. Human trials have shown beneficial effects of pomegranate phytochemicals in skin disorders, cardiovascular health, sexual health, diabetes and oral health.<sup>1</sup> The aim of this article is to review the functional application of physiological properties of pomegranate as an anti-plaque agent in preventive dentistry.

#### Evidences of Pomegranate as A Chemotherapeutic Agent

An ideal chemotherapeutic plaque control agent should essentially have specificity for plaque bacteria, substantivity and stability, absence of adverse reactions, toxic safety, ecological safety and ease of use.<sup>2</sup> No agent has been found to satisfy all these criteria. Though herb like sanguinarine has been identified as anti-plaque agent, its use in practice is limited. Chlorhexidine has been widely used but due to its side effects of disturbance of taste sensation and brown staining of teeth and prosthetic appliances, research for its alternative is required.<sup>3</sup> Dental anti-plaque phytotherapy can prove to be much needed alternative to conventional treatments if supported by

scientific-based evidence. Pomegranate is unique because each part of the plant (peel, arils, juice, whole fruit, leaves, seed, barks and root) has the potential to satisfy van der Ouderaa's criteria.

The chemical composition of the fruits differs depending on the variety and the cultivation conditions. Among the different parts of the fruits, 50% of weight corresponds to the peel. Phenolic compounds found in the peel are the main contributors of the functional properties of pomegranate fruit. These compounds include phenolic acids, phenylpropanoids, flavonoids, lignins, melanins, tannins. Flavonoids are the most common and widely distributed compound. Anthocyanins are the largest and most important group of flavonoids present in pomegranate arils, which are used to obtain the juice. These pigments give the fruit and juice its red colour. Polyphenolic flavonoids are anti-microbial and antioxidant. The rest of the fruit consists of 40% arils and 10% seeds. Pomegranate juice, leaves, peel and flowers are rich in tannin. The components of pomegranate juice (Tannins, punicalagin, punicalin, strictinin A, and granatin B) were found to significantly inhibit nitric oxide production and suppress inflammatory cytokine expression. Pomegranate extract also inhibit cytokine IL-8, prostaglandin PGE2, and nitric oxide secretion, due to the action of the ellagic acid present in pomegranate.

Studies in support of pomegranate use in oral health have been limited to *in-vitro* studies, though few *in-vivo* studies have also been done. Pomegranate rinsing was found to reduce activity of  $\alpha$ -glucosidase (sucrose-degrading enzyme), in the saliva and it was also found to increase activities of ceruloplasmin (an antioxidant enzyme).<sup>4</sup> Pomegranate extract when used for treatment of denture stomatitis associated with fungal infection candidiasis was found to be very effective.<sup>5</sup> Tannins from pomegranate fruit has been found to inhibit human salivary  $\alpha$ -amylase, which catalyzes the hydrolysis of starch to oligosaccharides and binds to viridians streptococci and

enamel, therefore providing substrate for cariogenic microbes.<sup>6,7</sup> The effects of pomegranate fruit extract on periodontal therapy have also been studied and the authors concluded that a gel containing extracts of *Centella asiatica* and *Punica granatum* was an effective adjunct to conventional periodontal therapy.<sup>8</sup> Chewing of pomegranate could bring the antibacterial and antioxidant agents in direct vicinity of teeth and gingiva as well as enhance the salivary flow rate. Pomegranate flower extract can inhibit bacterial sucrose digesting enzyme responsible for initiating dental caries and gingivitis.<sup>9</sup> Local action or topical effects of antioxidant agents from pomegranate on the oral tissues have been hypothesized to have preventive effect against diseases of the oral cavity.<sup>10</sup> Pomegranate extracts were also found to reduce the aspartate aminotransferase activities (an indicator of cell injury in periodontal pathology) in the saliva.<sup>11</sup> The hydroalcoholic extract from pomegranate fruit has shown to decrease the Colony Forming Unit (CFU) per millilitres of dental plaque by 84% and has been recommended as a possible alternative treatment for reducing dental plaque bacteria.<sup>12</sup> Pomegranate was found to be conducive to maintenance of oral hygiene when development of gingivitis was measured.<sup>13</sup> One minute rinse with a mouthwash containing pomegranate extract successfully reduced the amount of microorganisms cultured from dental plaque. Therefore use of phytochemical agents from pomegranate through a toothpaste or mouthwash can be beneficial.<sup>13</sup> Punicic acid, present in pomegranate seed oil has shown to down-regulate the neutrophil activation and lipid peroxidation consequences and hence act as an anti-inflammatory agent.<sup>14</sup> Pomegranate can be a part of a balanced diet with no risk of toxic reactions. Consumption of pomegranate juice (121 mg/L ellagic acid equivalents) for up to 3 years had no toxic effect on blood chemistry, or on kidney, liver, or heart functions.<sup>15</sup> When evaluating pomegranate extract dietary supplements, on safety in overweight human subjects, researchers found no serious adverse events.<sup>16</sup> Systemic use of pomegranate extract did not result in any toxicologically significant treatment-related changes in clinical observations, ophthalmic examinations, body weights, body weight gains, feed consumption, clinical pathology evaluations, or organ weights.<sup>17</sup>

## CONCLUSION

Pomegranate fruit has been part of the Indian diet for a very long time. It was used in ayurvedic medicine as the healing food. With advancement in science and technology, rationale for its regular use has now been discovered. Extracts and juice of pomegranate has shown optimistic study results in reducing plaque development, and as an anti-cariogenic agent. Though there is lack randomized clinical trials to substantiate the claim. Based on the available literature, it would be the most suitable natural alternative to current chemical plaque control agents.

In a nut-shell the pomegranate fruit can not only prevents oral diseases, but it also provides a palatable and a nourishing experience for all age groups. Pomegranate is therefore a true functional food.

## REFERENCES

- Viuda-Martos M, Fernandez-Lopez J, Perez-Alvarez JA. Pomegranate and its many functional components as related to human health: A Review. *Comprehensive Reviews in Food Science and Food Safety* 2010; 9:635-54. <http://dx.doi.org/10.1111/j.1541-4337.2010.00131.x>
- Van der Ouderra FJ. Anti-plaque agents: Rationale and prospects for prevention of gingivitis and periodontal disease. *J Clin Periodontol* 1991; 18:447-454. <http://dx.doi.org/10.1111/j.1600-051X.1991.tb02315.x> PMID:1890227
- Dean JA, Hughes CV. Mechanical and chemotherapeutic home oral hygiene. In: Dean JA, Avery DR, McDonald RE, editors. *Dentistry for the Child and Adolescent*. 9th ed. New Delhi: Mosby-Elsevier Publisher; 2011. p 205-22. <http://dx.doi.org/10.1016/B978-0-323-05724-0.50015-1>
- Bielli P, Calabrese L. Structure to function relationships in ceruloplasmin: A 'moonlighting' protein. *Cell Mol Life Sci* 2002; 59:1413-27. <http://dx.doi.org/10.1007/s00018-002-8519-2>
- Vasconcelos LC, Sampaio MC, Sampaio FC, Higino JC. Use of *Punica granatum* as an antifungal agent against candidiasis associated with denture stomatitis. *Mycoses* 2003; 46:192-96. <http://dx.doi.org/10.1046/j.1439-0507.2003.00884.x>
- Kandra L, Gyemant G, Zajacz A, Batta G. Inhibitory effects of tannin on human salivary  $\alpha$ -amylase. *Biochem Biophys Res Commun* 2004; 319:1265-71. <http://dx.doi.org/10.1016/j.bbrc.2004.05.122> PMID:15194503
- Scannapieco FA, Torres G, Levine MJ. Salivary  $\alpha$ -amylase: Role in dental plaque and caries formation. *Crit Rev Oral Biol Med* 1993; 4:301-7. PMID:8373987
- Sastravaha G, Gassmann G, Sangtherapitikul P, Grimm WD. Adjunctive periodontal treatment with *Centella asiatica* and *Punica granatum* extracts in supportive periodontal therapy. *J Int Acad Periodontol* 2005; 7:70-9. PMID:16022023
- Li Y, Wen S, Kota BP, Peng G, Li GQ, Yamahara J, et al. *Punica granatum* flower extract, a potent  $\alpha$ -glucosidase inhibitor, improves postprandial hyperglycemia in Zucker diabetic fatty rats. *J Ethnopharmacol* 2005; 99:239-44. <http://dx.doi.org/10.1016/j.jep.2005.02.030> PMID:15894133
- Halliwel B, Zhao K, Whiteman ML. The gastrointestinal tract: A major site of antioxidant action? *Free Rad Res* 2000; 33:819-30. <http://dx.doi.org/10.1080/1071576000301341> PMID:11237104
- Nomura Y, Tamaki Y, Tanaka T, Arakawa H, Tsurumoto A, et al. Screening of periodontitis with salivary enzyme tests. *J Oral Sci* 2006; 48:177-83. <http://dx.doi.org/10.2334/josnusd.48.177> PMID:17220614
- Menezes SM, Cordeiro LN, Viana GS. *Punica granatum* (pomegranate) extract is active against dental plaque. *J Herb Pharmacother* 2006; 6:79-92. [http://dx.doi.org/10.1080/J157v06n02\\_07](http://dx.doi.org/10.1080/J157v06n02_07) PMID:17182487
- Di Silvestro RA, Di Silvestro DJ. Pomegranate extract mouth rinsing effects on saliva measures relevant to gingivitis risk. *Phytother Res* 2009; 23:1123-27. <http://dx.doi.org/10.1002/ptr.2759> PMID:19170139
- Lee CJ, Chen LG, Liang WL, Wanga CC. Anti-inflammatory effects of *Punica granatum* Linne *in-vitro* and *in-vivo*. *Food Chem* 2010; 118:315-22. <http://dx.doi.org/10.1016/j.foodchem.2009.04.123>
- Aviram M, Rosenblat M, Gaitini D, Nitecki S, Hoffman A, Dornfeld L, et al. Pomegranate juice consumption for 3 years by patients with carotid artery stenosis reduces common carotid intima-media thickness, blood pressure and LDL oxidation. *Clin Nutr* 2004; 23:423-33. <http://dx.doi.org/10.1016/j.clnu.2003.10.002> PMID:15158307
- Heber D, Seeram NP, Wyatt H, Henning SM, Zhang Y, Ogden LG, et al. Safety and antioxidant activity of a pomegranate ellagitannin-enriched polyphenol dietary supplement in overweight individuals with increased waist size. *J Agric Food Chem* 2007; 55:10050-54. <http://dx.doi.org/10.1021/jf071689v> PMID:17966977
- Patel C, Dadhaniya P, Hingorani L, Soni MG. Safety assessment of pomegranate fruit extract: Acute and subchronic toxicity studies. *Food Chem Toxicol* 2008; 46:2728-35. <http://dx.doi.org/10.1016/j.fct.2008.04.035> PMID:18571823

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