

Allium Sativum in The Management of Periodontal Diseases

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How to cite this article: Sibani Sarangi, Sumeet Kaur , K Sumana Mounya, Vijayanandhan Venkatesan, Jyoti Kasana, Ritik Kashwani, Sumana Kumar (2024) Allium Sativum in The Management of Periodontal Diseases, 44(3), 330-333.

ABSTRACT

Evidence suggests influence of both natural products and flavonoids on periodontal diseases when administered topically into the oral cavity owing to its action against inflammation, oxidation and bacterial activity. Allium sativum extract (ASE) with pharmacologically active sulphur compounds, alleviates the symptoms of gingivitis suggesting ASE to be a possible remedy for use as a therapeutic in management of periodontal infections [2]. This review discusses the beneficial effects of garlic and its extract on improving the periodontal conditions.

INTRODUCTION

BACKGROUND

Tracing back against time to the ancient period, it can be clearly observed that a wide array of plant products established its significance as therapeutics [1,2]. But with passage of time and advancements in the field of medical research, multiple rapid-acting broad and narrow spectrum antibiotics came into the limelight that gradually took over the charge as therapeutics [3]. However, progressing bacterial resistance to multiple antibiotic regimens has again become an hour of concern which has compelled the clinicians and researchers to think of an alternative therapy that gradually overcomes this emerging problem [4]. Further, the new regimen should fulfil the criteria of being anti-inflammatory, antimicrobial with minimum or negligible side effects and most importantly cost effective as well [5]. Keeping all these inclusion criteria into consideration the therapeutic demand is gradually shifting towards the pharmacologically active natural ingredient which had once become obscure. One such naturally occurring plant product that has fulfilled all criteria of therapeutics and has shown promising results in the management of multiple systemic disorders including periodontal diseases is *Allium sativum*, very commonly known as garlic [6]. Garlic, as famously it is known as is one of the extensively used species of Allium genera

enriched with biologically as well as pharmacologically potent organosulphur compounds that have a significant effect in combating multiple systemic illness and is also believed to have shown promising results in improving the periodontal status as well [7].

TYPES OF ALLIUM SATIVUM

Commercially, garlic is available in different forms. It can be either in form of emulsions or as fresh dried form. Variation in the variety, age, preservation criteria and methods of extraction of extracts also influences variation in the composition of extracts [8]. While fresh bulb extracts are rich source of alliin and derivatives of γ -glutamyl cysteine [9], steam distilled oils release compounds of sulphide family. Dried and crushed garlic powder is a rich source of alliin and diallyl disulphide [10]. Garlic in grounded form famously known as macerates have predominantly sulphide family compounds, dithianes and ajoene compounds. Aged garlic extract (AGE) is most widely used form of garlic as it expresses non-organic sulphur compounds along with S-allyl L-cysteine and S-allyl mercaptocysteine some of which includes tetrahydro- β -carboline, fructans and glucose linked β -D fructofuranosyl [11].

EFFECT OF GARLIC ON PERIODONTIUM

Several clinical studies have been conducted over time n again using different extracted forms of garlic to elucidate its specific effect on the diseased periodontal tissues.

Bakri IM et al in 2005 conducted a clinical study by using garlic extract in gingivitis condition and found out an inhibition to the growth of *P. gingivalis*.

Bachrach G et al [22] in 2011 used allicin to inhibit the growth of *A. actinomycetescomitans* and *F. nucleatum* and observed a decrease in the growth rate of these gram-negative periodontal pathogens.

Velliyagounder K et al in 2012 using diallyl sulfide inhibited growth of *A. actinomycetescomitans*.

Shetty S et al [6] in 2013 used ethanol and aged garlic extract in patients with periodontitis and its pharmacological action retarded the multiplication of *P. gingivalis* and *A. actinomycetescomitans*.

Recently in 2018, Safiaghdam H et al [5] helped gingivitis patients to alleviate gingivitis by applying AGE at the site of inflammation which showed promising results.

AGED GARLIC EXTRACT(AGE)

Aged garlic extract commonly known as AGE is the widely used variant of garlic. It has not only shown promising results in augmenting periodontal diseases but has also extended its beneficial action to serve a wide range of inflammatory disorders. It is an odorless product with a smoothening effect against harsh, irritating compounds. It is commercially available as tablets, capsules and liquids. It has a unique property of exacerbating its unique and beneficial effects via a series of interlinked enzymatic and chemical reactions. It has also been found that AGE and its component S-allyl L cysteine sulfoxide and DAS significantly retards the growth of the gram-negative bacteria *P. gingivalis*, *Aggregatibacter actinomycetemcomitans* and *Fusobacterium nucleatum* [12].

COMPOSITION OF AGE

Aged garlic preparation stands out to be unique among all forms of garlic as it expresses non-organic sulphur compounds missing in all other extracts in addition to abundant organic sulphur compounds. The abundant organo-sulphur compounds in AGE can be further classified as oil-soluble sulphur compounds and water-soluble sulphur compounds. Diallyl sulphide, Diallyl disulphide, Diallyl trisulfide, Vinyl dithiins and ajones fall into the former category and the later group undertakes S-allyl cysteine and S-allyl mercaptocysteine [13-15].

METHOD OF PREPARATION OF AGE

The method of preparation of aged garlic extract is a slow procedure. Grown raw garlic is first cut into slices and is immersed in 50% aqueous ethanol at 37 degree Celsius for more than 10 months. During this duration there is conversion of unstable compounds such as allicin to stable substances and several water soluble compounds including two major compounds S-allyl cysteine (SAC) and Di-allyl disulphide(DAD).The suspension obtained post 10 months is rich in SIPC,SAC,SAM,S-containing amino acids which is commonly known as AGE. This crude form of AGE is filtered and concentrated at low temperatures. This crude form of AGE undergoes the final procedure of purification. It is done by either passing the extract through high performance liquid chromatography or liquid chromatography mass spectrometry systems. Following this procedure we finally obtain a purified and structure determined AGE [16].

MECHANISM OF ACTION

Aged garlic extract has extended its beneficiary action into various diseased conditions through its anti-inflammatory, anti-tumour, immune -modulatory and anti-oxidant action by enhancing cellular antioxidant enzymes superoxide, dismutase, catalase& glutathione peroxidase, by scavenging reactive oxygen species (ROS) and alkaloid like substances such as D-allyl sulphide and S-allyl mercaptocysteine. However, to support this fact,

no clinical or in vivo experiment had been performed to determine the beneficiary action until Zini et al in 2018 conducted a randomised clinical trial using 151 participants to conclude that daily consumption of AGE benefits oral health by reducing gingivitis as compared to a placebo control [7].

AGE ON PERIODONTAL DISEASES

In case of gingivitis and periodontitis in response to inflammation, there is accumulation of macrophages and neutrophils as first line of defence which stimulates the secretion of TNF- α that further causes expression of ICAM-I gene that upregulates the secretion of IL-6 and produce synergistic effects on inflammation. However, with administration of AGE, SAC and SAMC that Inhibits the ICAM-I expression, down regulates IL-6 Secretion and acts as an antagonist decreasing inflammation [17].

CONCLUSION

With rising evidence supporting the multidirectional beneficiary effect of garlic in multiple systemic diseases including periodontal diseases owing to its protective and curative purposes. Increasing demand of bioactive compounds at global levels has introduced garlic in its wet, emulsified or dried forms. Its variants have time and again been tested in vitro/in vivo animal models to elucidate its effect on inflammation as well as its role on modulating the immune response of the host.

Though multiple experiments have been performed time and again to prove the potentiality of garlic as an antidote to periodontal infections, there is still a need for study on human beings in an extensive manner that includes huge sample size and strong methodologies which can not only prove its effects on human population but also help us decode the molecular configuration behind its anti-gingivitis effect .

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