

ORIGINAL ARTICLE

EFFICACY OF WHITE TEA EXTRACT MOUTHRINSE AS AN ANTI- INFLAMMATORY AGENT – A RANDOMIZED CONTROLLED CLINICAL TRIAL

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ABSTRACT

AIMS & OBJECTIVES : To assess the antimicrobial and anti-inflammatory efficacy of aqueous white tea extract mouthrinse and compare it with that of chlorhexidine gluconate.

METHODS: Antimicrobial activity of white tea extract was evaluated by Kirby Baur Well Diffusion method from the subgingival calculus samples collected from the patients. 30 periodontally healthy patients were chosen and randomly divided into three groups A, B, C (A – white tea, B – placebo, C – chlorhexidine). They were instructed to use mouthwashes twice daily for 21 days. Oral Hygiene Index and Gingival Bleeding Index were measured at baseline and day 21. **RESULTS :** The results showed that the zone of inhibition of white tea extract was 9.5mm whereas for chlorhexidine gluconate it was 12mm. OHI and GBI significantly increased from baseline to 21 days in all the three groups. But chlorhexidine had higher anti-inflammatory effect when compared to white tea mouthrinse. **CONCLUSION :** White tea is a natural beverage with effective antimicrobial and anti-inflammatory property that can be chosen as the best alternative for chemical antimicrobial agents in periodontal diseases **KEY WORDS :** Camellia Sinensis, white tea, antimicrobial activity, zone of inhibition, anti-inflammatory activity, mouthrinse.

INTRODUCTION:

Periodontitis is a chronic slowly progressive polymicrobial infectious disease which affects the entire tooth-supporting tissues.¹ Effective prevention of periodontal disease could be achieved by proper and regular tooth brushing, flossing and rinsing with antibacterial agents containing mouthwashes like chlorhexidine, sodium hypochlorite, cetylpyridinium chloride and amine fluoride.

Moreover, chlorhexidine gluconate was shown to have undesirable side effects such as staining, burning sensation and promoting calculus formation.² Due to these potential side effects of chemical agents, there is a need for alternate agents with marked antibacterial activity and less toxicity to be used as mouthwashes and irrigating agents. Recently antimicrobial activities of medicinal plants and their extracts are gaining more attention as an useful alternative to synthetic chemical agents.^{3,4,5, 6}

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Tea is the most widely consumed beverage which grows primarily in the tropical and temperate regions of Asia. The chemical composition of tealeaves includes polyphenols, caffeine, theobromine, theophylline and other methylxanthines, lignin, organic acids, chlorophyll theanine, free amino acids, and numerous flavor rich compounds.⁷ Besides these, flavones, phenolic acids and depsides, carbohydrates, alkaloids, minerals, vitamins and enzymes are also present. Tea also contains flavanols, mainly quercetin, kaempferol, myricetin, and their glycosides.⁸

White tea that is prepared from tea buds, is steam dried quickly after the leaves are picked and there is no oxidation at all. It contains the most antioxidants and catechins, the least caffeine, and has a pale yellow color with a delicate, sweet taste. The leaves and buds are allowed to wither in sunlight and then they are lightly processed to prevent oxidation or further tea processing.

No studies have been done to investigate the anti-inflammatory efficacy of white tea on calculus samples. Hence this study aims in evaluating the antimicrobial and anti-inflammatory efficacy of white tea extract and compares it with that of chlorhexidine gluconate.

MATERIALS AND METHODS:

Preparation of white tea extract:

Dried white tea leaves were purchased from the market and weighed in microbalance. **(Fig 1)** 50g of the weighed leaves were soaked for 48hours in 500ml distilled water in a 1000ml sterile beaker. Using Whatman filter paper No 1 the extract of the white tea leaves were filtered. Filtrates were then concentrated and stored at 1.6°C till use. **(Fig 2)**



Fig.1 Dried White Tea Leaves



Fig.2 White Tea Extract

Antibacterial activity of white tea extract:

Antibacterial activity of white tea extract was determined using the agar well diffusion method of Kirby Bauer. Subgingival calculus samples were collected from the molar regions from 10 subjects and stored in saline till culturing. **(Fig.6)** The collected sample was incubated at 37°C for 24 hours in peptone broth and checked for turbidity. The culture was spread using sterile swab on Muller Hinton agar plate and wells were prepared using sterile well borer.

Fixed volumes (0.1 ml) of the white tea leaf extract, chlorhexidine mouthwash and distilled water was introduced into the wells respectively. The zone of inhibition of the three wells from 10 different samples were measured after 24hrs of incubation and the mean was calculated.



Fig 3. Collection of calculus sample



Fig 6. Zone of inhibition of distilled water



Fig 4. Zone of inhibition of chlorhexidine mouthrinse



Fig 5. Zone of inhibition of white tea mouthrinse

Preparation of white tea extract mouthrinse:

1mg of white tea extract was mixed with 100ml of distilled water in a sterile beaker and then transferred to sterile containers for the use of patients.

Study Design:

The current study is a randomised controlled clinical trial. 30 healthy patients above the age of 13 years were chosen and were randomly divided using envelope method. The mouthwashes were labelled as A (white tea mouthrinse), B (placebo – distilled water) and C (chlorhexidine gluconate). Subjects who were co-operative with no clinical signs of active periodontal disease and patients with mild to severe gingivitis were included in the study.

Patients with systemic or metabolic diseases, who had less than 20 teeth, smokers, physically or mentally challenged, pregnant and lactating women, prior history of periodontal treatment in the past 6 months were excluded from the study.

30 patients of Vivekanandha Dental College for women, Tiruchengode, Tamilnadu, India who complied the inclusion criteria were selected and the study was approved by The Ethical Committee of the same institution.

At baseline, oral hygiene index and gingival bleeding index were measured and thorough oral prophylaxis was given. Patients were instructed to use 10ml of mouthrinse twice daily for 21 days. Patients were recalled after 21 days and OHI and GBI were again measured at 21st day.

STATISTICAL ANALYSIS:

The recorded index measurements were decoded and tested using SPSS software 20.0. The mean and standard deviation was calculated for each mouthwash and for the zone of inhibition. Intergroup differences were analysed using Bonferroni multiple comparison test. The variance analysis was done using ANOVA test.

RESULTS:

All the 30 subjects completed the study. The PI value showed statistically significant increase from baseline to 21 days. PI values were highest for placebo mouthwash and least for chlorhexidine gluconate. The PI value of white tea mouthwash was higher than that of chlorhexidine and lower than that of distilled water. ANOVA showed statistically significant difference for all the groups. (P=0.001)

The zone of inhibition observed for white tea extract was 9.5mm and for chlorhexidine mouthwash 12mm was observed. The zone of inhibition of aqueous extract of white tea was found to be lesser than that of chlorhexidine mouthwash while no zone of inhibition was found around distilled water.

Table 1: Zone Of Inhibition Of All the Samples After 24hrs

SAMPLES	WHITE TEA EXTRACT	CHLORHEXIDINE MOUTHWASH	DISTILLED WATER
Sample 1	5mm	10mm	0mm
Sample 2	10mm	15mm	0mm
Sample 3	10mm	13mm	0mm
Sample 4	10mm	10mm	0mm
Sample 5	15mm	10mm	0mm
Sample 6	10mm	10mm	0mm
Sample 7	20mm	15mm	0mm
Sample 8	5mm	15mm	0mm
Sample 9	5mm	13mm	0mm
Sample 10	10mm	10mm	0mm

Table 2: Results of Oral Hygiene Index and Gingival Bleeding Index from baseline and 21 days later.

	OHI		GINGIVAL BLEEDING INDEX	
	Baseline	21 days	Baseline	21 days
Group A (White Tea)	3.39	0.91	15.8	7.2
Group B (Placebo)	2.71	1.38	17.8	10.6
Group C (Rhexidine)	2.45	0.33	14.2	2.9

Table 3: Results of OHI and comparison between groups using one-way analysis of variance

SAMPLE	MEAN	SD	P
White Tea	3.39	0.91	0.001*
Placebo	2.71	1.38	
Rhexidine	2.45	0.33	

* Statistically significant at P<0.05. SD – Standard Deviation. OHI – Oral Hygiene Index

Table 4: Results of GBI and comparison between groups using one-way analysis of variance

SAMPLE	MEAN	SD	P
White Tea	7.2	1.98	0.001*
Placebo	10.6	1.57	
Rhexidine	2.9	0.87	

* Statistically significant at P<0.05. SD – Standard Deviation. GBI – Gingival Bleeding Index

Table 5: Comparison between groups using Bonferroni multiple comparison test

SAMPLE COMPARED	P
Chlorhexidine versus white tea	0.001*
Distilled water versus chlorhexidine	0.001*
Distilled water versus white tea	0.001*

* Statistically significant at P<0.05

DISCUSSION:

White tea has been considered the most advantageous alternative of green tea since it has tremendous benefits.⁹ Epigallocatechin gallate (EGCG) is the main active compound of non-fermented tea from *Camellia sinensis*, and several studies found that approximately 20% of EGCG in the white tea extract, may have beneficial effects of tea found in this study. White tea contains a number of polyphenolic compounds which have a wide spectrum of antioxidant, antiviral, anticancer, antitoxoplasmal, antihelminthic properties.^{10,11,1} It also contains fluoride, tannins, and flavonoids.¹³

Polyphenols help in neutralizing the free radicals in the body and strengthens elastin and collagen.¹⁴ The tea extract may prompt apoptosis or cell death and may help in preventing new cell growth.¹⁵ Regular intake improves bone density and may provide relief from the symptoms of osteoporosis.¹⁶

Side effects associated with white tea are primarily caused by its caffeine content. Some of the most common side effects of internal white tea consumption include insomnia, dizziness and gastrointestinal discomfort. Topical application of white tea extract may cause skin irritation. It may also cause heart problems if consumed excessively.

Also consumption of white tea before going to bed is not recommended as its caffeine content can inhibit sleep and keep one awake.¹⁷ The flavonoids, polyphenols, tannins present in white tea are the major constituents responsible for the antibacterial and antiplaque effect of white tea.

The present study evaluated the antimicrobial and anti-inflammatory efficacy of aqueous white tea extract and compared it with that of distilled water and chlorhexidine mouthwash. Agar well diffusion method of Kirby Bauer which is considered as a standard method was used to assess the antimicrobial activity. The results indicated that the extract of *Camellia Sinensis* (white tea) indicates the

presence of potent antibacterial activity which confirms its use against infection.

The assessment of antimicrobial activity was based on measurement of zone of inhibition formed around the well. A mean of 9.5mm was observed around white tea extract and a mean of 12 mm was observed around chlorhexidine mouthwash. The zone of inhibition of aqueous extract of white tea was found to be nearly equal to that of chlorhexidine mouthwash while no zone of inhibition was found around distilled water.

In all groups, OHI showed statistically significant difference from baseline to day 21. The present study showed significant and comparable reduction in OHI and GBI in white tea and chlorhexidine group as compared to distilled water ($P=0.001$). White tea mouthrinse showed significant reduction in OHI & GBI from baseline to day 21, though less efficacious than chlorhexidine. At the end of the study no adverse effects of white tea mouthwash were seen in any of the subjects. More studies using longer duration and larger sample size and a cross-over model can be performed for further research

Previous studies by S.Archan and Jayanthi Abraham., 2011 was conducted using green tea extract and the results showed that they had potent antimicrobial activity. They also concluded that the combined use of tea and antibiotics could be also useful in fighting emerging drug-resistant problem.¹⁸

A study by Dipika Kalyan Mitra et al., in 2016, stated that white tea mouthrinse potently inhibits plaque formation. Though the efficacy was less than that of chlorhexidine, it still can be used as an alternative for chlorhexidine.¹⁹

One of the limitations of this study is the smaller sample size and antibacterial activity was not assessed against a specific isolated periodontopathogen. There is more invitro evidences on the advantages of white tea that are inconclusive. Hence more researches and long term clinical trials will be

beneficial for the deeper knowledge of the advantages of white tea.

CONCLUSION:

White tea extract mouthrinse is shown to be an effective antibacterial and anti-inflammatory agent although not as superior as chlorhexidine mouthrinse. Still white tea mouthrinse can be used as an alternate for chlorhexidine and also in patients with periodontal diseases who prefer herbal products.

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