Antimicrobial Effects of Some Plant Extracts on the Oral Pathogens Around the Removable Denture

Hakan Demir¹, Tuğba Demir²

¹ Faculty of Dentistry, Department of Prosthodontics, Cumhuriyet University, Sivas, Turkey
² Hafik Kamer Ornek Vocational School, Department of Food Technology, Cumhuriyet University, Turkey

Corresponding Author: Hakan Demir
hdemir@cumhuriyet.edu.tr

ABSTRACT

Objective: It was aimed to use herbal alternatives in minimizing the oral pathogen floras of patients using removable denture. Method: Antimicrobial activities of green tea, mint, and clove extracts on the various concentrations of significant pathogens of Streptococcus mutans, Staphylococcus aureus, and Enterococcos fecalis were examined. Moreover, the inhibition effects of the most effective herbal extracts, which were selected by examining the in-vivo study findings, on the oral flora of individuals using removable denture were compared with chlorhexidine control group. Results: the highest inhibition against S. mutans bacteria in vitro studies was clove plant. (18.5±0.7mm, 2h), in vivo findings, aerobic oral pathogen fluorescence decreased in all 4 groups. Four different groups of patients were selected. Aerobe microorganisms were isolated from the mouth flora prior to administration. At the end of each day during the course of the analysis, the effect of Extracts on oral pathogens was examined. The application was completed at the end of the fourth day. The highest inhibitions in patients were; respectively; Green tea; 43.5%, mint; 48.4%, clove; 46.3% and chlorhexidine; 38.8%.

Keywords: Removable denture, antimicrobial effects, plant extracts, oral pathogens

1. INTRODUCTION

Many of the therapeutic effects of the plants have been explored coincidentally, whereas some others have been explored experimentally and developed to date. The written resources date the medical use of plants to 4000-5000 BC (1). The data published by World Health Organization (WHO) indicate that approx. 20.000 plants are used for therapeutic purposes. As in entire world, various plants are used also in our country for therapeutic purposes (2). Under favor of Turkey’s geographical position and climate and herbal diversity, Turkey is one of the leading countries in terms of medicinal plants. The plants are generally collected from the nature and consumed as tea by brewing with water for medical purposes (3). The phenolic contents in the plants used for ensuring the oral hygiene came to the fore in recent years under favor of their positive effects on the human health. The plant extracts play role in preventing the caries process under favor of their anti-cariogenic effects thanks to their phenolic contents (4). In recent years, the unconscious use of antibiotics in the world was reported to cause the human pathogen bacteria to gain resistance against the medications (5). For this reason, the treatment of micro-organismal infections became more difficult. This made a tremendous impact on the scientific society and encouraged the researches on new antimicrobial

compounds in new sources. In previous studies, it has been reported that the plants are the rich sources, from which the antimicrobial materials can be obtained. Nowadays, the plants having significant antimicrobial activity as an important resource for struggling with infectious diseases have properties that are similar to those of modern medications. Based on their chemical structures, the antimicrobial contents of plants are grouped under classes named phenolics, terpenoids, essential oils, alkaloids, lectins and polypeptides, and poly-acetylenes.

Some of the previous studies have concentrated on the synergic effect of plants, and reported that the therapeutic effect of plants offer better treatment by struggling with resistance of microorganisms, which are hard to eliminate by using a single antibiotic, under favor of using multiple herbal components. This canalizes the researchers into investigating the multiple components of antimicrobial agents obtained from the herbal extracts, which have inhibition effects.

Other than the clinic phase, the most important problem observed in prosthetic dentistry is the maintenance and hygiene of denture. The denture group, which is exposed to highest level of bacterial flora, negatively affects the oral hygiene and consequently the entire health. Such that, putting the teeth outside the denture into risk accelerates the caries risk of healthy teeth. The bacteria decrease the plaque’s pH via the acid arising from carbon-hydrate metabolism by the bacteria, and cause the enamel layers to demineralize. Despite the microbial diversity of oral flora, S. mutans and S. sobrinus are considered to be the primary etiologic factor of caries.

In previous studies, the green tea, which is the most frequently studied one among the alternative herbal therapies applied on the oral flora, has been shown to have inhabitation effect on S. mutans and S. sobrinus. Depending on the type of prosthetic restorations, it is necessary to examine the flora and defense mechanisms in oral cavity in order to reveal the changes in oral flora and the causes of these changes. From the aspect of oral ecological balance, oral mucosa creates a mechanical obstacle, and its defensive role originates from its keratinization.

Majority of the microorganisms in mouth have the capability of creating pathogenicity. Some of these pathogenicities caused from the normal flora bacteria are the caries, periodontal diseases, and gingivitis, and subacute bacterial endocarditis. The disease-causing bacteria’s capability of causing disease is related with the toxic structure of bacteria and their easy distribution throughout the body.

The denture treatment materials are the structures, on which the various microorganisms can easily settle. The dentures might cause tissue injury in their locations as a result of their mechanical effects, as well as they might also cause the clinically harmful shapes by leading to tissue injuries in residual monomers.

The green tea polyphenols, which are a strong antioxidant, bind the reactive oxygen and nitrogen species. With its antibacterial effect, the green tea prevents the formation of plaque and caries in mouth and helps with eliminating the malodor. Moreover, it also prevents the development of Helicobacter pylori that causes ulcer in gut and bowels.

The mint is a functional herb that is consumed in many ways in our society. It has antimicrobial, expectorant, antioxidant, anti-inflammatory, antifungal, cytotoxic and anti-carcinogenic properties. The mint has been reported to be widely used in relieving the tooth pain.

Clove (Eugenia caryophyllata) has its specific odor and taste that are provided by the essential oil named ‘eugenol’. Since eugenol constitutes the majority of clove extract, it is the main anti-oxidative component of the plant and is used as antiseptic and analgesic in dentistry.

In the present study, the antimicrobial activities of green tea, mint, and clove extracts on the various concentrations of significant pathogens of S.mutans, S.aureus, and E.fecealis were examined. Moreover, the inhibition effects of the most effective herbal extracts, which were selected by examining the in vivo study findings, on the oral flora of individuals using removable denture were compared with control group (chlorhexidine in vivo). It was aimed to use herbal alternatives in minimizing the oral pathogen floras of patients using removable denture.

2. METHODS

The plants used in this study were procured in ready-to-use form from the local herbalists. The pathogens used in examining the antimicrobial activity were obtained from the Microbiology Laboratory of Cumhuriyet University. For the in vivo studies, the voluntary patients were involved form the Prosthetic Dentistry Department of Dentistry Faculty, Cumhuriyet University.

The herbal extracts; the aqueous extractions of plants (2g/ml 100°C 30min, 1h, 2h) were prepared in shaking
water bath, sterilized in microwave, and then kept in refrigerator at +4°C until the moment of analysis. The chlorhexidine was procured in ready-to-use form.

**Antimicrobial Activity in vitro**

**Preparation of Bacterial cultures**: The Nutrient agar was used as agar for the bacterial cultures, whereas Sabourad Dextrose agar was used as specific agar for the molds. 20ml sterilized agars were poured into 90mm-diameter sterile petri plates. For the reproduction of bacterial cultures, they were kept at 37 °C, while the mold cultures were incubated at 30°C in drying oven for 20-24 hours. In preparing the bacterial cultures used in order to determine the minimum inhibition concentrations, the sloping agars containing Nutrient agar were used. The bacteria reproduction occurred in 24 hours at 37 °C. In preparation of bacterial cultures, the method prepared by Ebrahimabadi et al. (2010) was employed (25).

**Disc-Diffusion Method**: The colonies taken from 18-24h fresh cultures of microorganisms produced in selective agar were dispensed in physiological saline, compared to 0.5 McFarland turbidity tube, and 108 CFU/ml dilutions of them were prepared. These dilutions, which are also known as inoculum, were used. The petri plates containing Mueller Hinton agar were planted with 100 μl bacteria dilution via sterile pipet by using swab. 35 μl of the dispersions were engrafted into the empty sterile discs with diameter of 6 mm. Then, the discs were appropriately placed onto the petri plates, and the incubation was set to be 18-24 hours at 37 °C for bacteria and 30 °C for molds in drying oven. Chlorhexidine was used as a standard for comparison. At the end of incubation, the inhibition zones' diameters were measured using millimeter ruler, and the results were recorded (25).

**Determining the Minimum Inhibition Concentration (MIC)**: In determining the minimum inhibition concentration values, the method recommended by Oskay et al. (2007) was employed(26). In preparing the bacterial cultures to be used, the slant agars containing Nutrient agar were utilized. The bacterial reproduction was performed at 37 °C for 24 hours. Using 24-h fresh cultures, the inoculum suspension was prepared. The minimum inhibition concentrations of plant samples optimum conditions were determined using macro broth method. Taking 25 μl (1×108 cfu/ml) from each of bacterial cultures (18 hour fresh), 3 ml Müller Hinton Broth and a series of plant extracts (starting from 30 mg/ml up to 0.46 mg/ml concentration) dilutions were transferred to the test tubes and then incubated for 24 hours at 37°C. After the incubation, the minimum extract in the tubes, in which no growth was observed, was determined as MIC value. Moreover, 50 μl from the tubes, in which no turbidity developed, was planted into Müeller Hinton agar. It was checked if any growth occurred. Thus, the Minimum Bactericide Concentration (MBC) was determined too.

**Antimicrobial Activity Determination Method in vivo**

16 volunteer patients receiving treatment in Prosthetic Dentistry Department of Cumhuriyet University were involved in this study. The patients were divided into 3 groups. The mouthwashes containing green tea, mint, and clove extracts and chlorhexidine were examined for 4 days on patient groups, 4 patients each. The patients were selected among the individuals, who do not smoke, have no caries or periodontal problem and no allergy for chlorhexidine. Firstly, the amount of aerobic bacteria was determined using the oral floras of patients. For this purpose, the samples were taken from 2 points of removable dentures of patients. In order to ensure the standardization in sampling, the Periopaper Strips that are sterile and ready-to-use were used. Periopaper Strips were contacted to mucosa for 5 minutes for soaking the saliva and then taken into Eppendorf tubes containing 1 ml 0.9% isotonic sodium chloride. The samples were taken from the patients on first day before washing their mouth with herbal extracts. And then, the next samples were taken after washing their mouth with herbal extracts for 20 seconds. The patients were asked to wash their mouth for twice after the clinic. The saliva samples taken using Periopaper Strips were put into Eppendorf tubes containing 1 ml physiological saline solutions, and then the microbiological examinations were executed. The tubes were vortexed for 1 minute for homogenization. 100ml of samples were planted into agar plates, which contain 5% sheep blood, by using drigalski spatula. These plaques were incubated under atmospheric conditions for 48 hours at 37°C'.

**Aerobic Culture**: EMB (Eosin Methylene Blue), chocolate-like agar, and bloody agar were used for plantation. The preparations were left for incubation for 48 hours at 35°C in 10% CO2 medium. Then, the aerobic bacteria were identified.

**Identifying the Aerobic Bacteria**: The identifications were performed based on the bacteria, which were positive for aero-tolerance test, by staining the bacteria. The presence of catalysis enzymes was tested for the gram-positive coccus bacteria. The coagulase

enzymes of catalysis-positive and gram-positive coccius bacteria were examined. Accordingly, they were identified as Staphylococcus aureus or coagulase-negative staphylococcus (identified based on the sensitivity to bacitracin disc for Micrococcus species). The catalase-negative and gram-positive coccius bacteria were classified as Enterococcus or Streptococcus based on their reproduction in 6.5% NaCl environment and hydrolysis of esculent by using API Strep commercial kit at species level.

The gram-positive bacillus was identified based on their staining properties and colony morphologies in agars. The bacteria stained in gram-negative diplococcus form were identified based on the presence of oxidase enzyme and colony morphology in agar.

3. RESULTS AND DISCUSSION

The α-amylase in saliva facilitates the digestion of carbon-hydrate digestion, as well as increasing the cariogenic bacteria’s potential of creating caries. Polyphenols reduce the digestion activity if α-amylase. Thus, it has anti-caries effect(27). Another benefit of polyphenols in green tea is that they prevent the microorganisms’ adhesion to hard tissues of teeth. Thus, they prevent the formation of dental plaque, and help with reducing the microorganisms’ acid creation on the surface of teeth.

The in vivo antimicrobial activities of green tea, mint, and clove on selected pathogens were examined using disc diffusion and MIC methods, and the results are presented in Table 1 and Figure 1. It was observed that the extraction durations of plants played significant role in antimicrobial activity results of plants on S.mutans, S.aureus, and E.fecealis. These results shed light to the processes to be selected in the in vivo studies to be carried out.

The 2-hour extraction of clove plant showed the highest level of antimicrobial activity on all 3 selected pathogens (18.5mm, 16.5mm, and 14.5mm) and MIC (1.87mg/ml, 3.75mg/ml, and 7.5mg/ml), whereas 1-hour extraction of mint and green tea provided the effective zone and inhibition. The antimicrobial order for 1-hour extractions of green tea and mint was S.mutans > S.aureus > E.fecealis. The antimicrobial zone measurements of all the extracts showed parallelism with the inhibitions and control.

Table 1: Disc Diffusion Results of Plant Extracts.

<table>
<thead>
<tr>
<th>Inhibition Zone(mm)</th>
<th>Control</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>(+)</td>
</tr>
<tr>
<td>S.mutans</td>
<td>14,5±0,7</td>
</tr>
<tr>
<td></td>
<td>17,5±0,7</td>
</tr>
<tr>
<td></td>
<td>17±1,4</td>
</tr>
<tr>
<td>S.aureus</td>
<td>12,5±0,7</td>
</tr>
<tr>
<td></td>
<td>14±1,4</td>
</tr>
<tr>
<td>E.fecealis</td>
<td>11,5±0,7</td>
</tr>
<tr>
<td></td>
<td>12,5±0,7</td>
</tr>
<tr>
<td></td>
<td>14,5±0,7</td>
</tr>
<tr>
<td></td>
<td>14,5±0,7</td>
</tr>
</tbody>
</table>

*Disc diameter 6mm
Intraoral pH levels between 4 and 5 facilitate the survival and reproduction of lactobacillus, Candida albicans, acidogenic and aciduric species such as certain streptococci. In a previous study on green tea and black tea, the capability of inhibiting S.mutans was examined at various concentrations, and it was reported that green tea concentrations higher than 150mg/ml inhibited S.mutans\(^{28}\).

Xu et al. reported in their study on green tea’s virulence activity on S. mutans that the green tea showed antimicrobial effect on S.mutans and suppressed the carries development and relevant virulent factors\(^{29}\).

In different mouthwashes, the antimicrobial activity of mouthwash containing mint essence was found to be high, and they showed inhibition zones of S.mutans: 25mm, S.salivarius:16mm, and S.aureus: 30mm\(^{30}\).

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**Figure 1: Minimum Inhibition Concentrations of Plant Extracts**

In vivo results
In the in vivo study on patients, the pre-washing numbers of aerobic microorganisms isolated from the flora around the denture were found to be 80, 84, 92, and 87 for the patients in Green Tea group. According to the isolation results, the highest group was found to be unidentified KNS group, whereas the lowest rank was found to be that of S. oralis. For the patients in green tea group, a decrease was found in total number of isolated aerobic bacteria. In green tea group, the values of patients at the end of 4th day decreased to 46.3% for 1st patient, 46.4% for 2nd patient, 43.4% for 3rd patient, and 45.8% for 4th patient. The effect of green tea on the oral flora of selected patients positively decreased. The inhibition of aerobic microorganisms after green tea agitation is shown in the Table 2.

Table 2: Aerobic Microorganisms After Green Tea and Mint Rinse

<table>
<thead>
<tr>
<th>Green Tea (%)</th>
<th>Mint (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>P2</td>
</tr>
</tbody>
</table>

1. Total KNS: Enterococcus spp. (P1: 9 3 11 5 13 5 11 4 6 2 9 5 14 6 10 5)
2. Lactobacillus spp. (P2: 5 2 5 2 4 1 5 2 5 2 7 4 5 3 7 3)
4. Staphylococcus aureus (P4: 8 3 9 4 10 4 11 5 10 4 9 5 10 5 10 4)
5. Isolated KNS: Staphylococcus epidermis (P5: 9 4 10 3 11 5 10 4 9 4 11 7 9 4 9 4)
6. Non-Isolated KNS (P6: 5 2 6 2 7 2 6 2 6 2 4 2 8 4 7 3)

Isolated Streptococcus spp.
7. Streptococcus mutans (P1: 3 1 4 1 5 1 5 2 4 2 6 3 5 3 6 3)
8. Streptococcus salivarius (P2: 3 2 4 2 3 2 4 2 3 2 4 3 4 2 5 3)
9. Streptococcus oralis (P3: 8 5 7 5 9 5 8 5 9 5 8 5 8 6 9 5)

TOTAL (P4: 80 37 84 39 92 40 87 40 82 40 83 47 93 45 89 44)

P: Patient, 0.D: first day number of aerobic microorganisms before shaking, 4.D: fourth day number of aerobic microorganisms after shaking.

In in-vivo study on patients, the pre-washing numbers of aerobic microorganisms isolated from the flora around the denture of mint group patients were found to be 80, 83, 93, and 89. In terms of isolation results, the highest score was that of unidentified KNS group, whereas the lowest score was that of S. aureus. In mint group, a decrease was found in total number of isolated aerobic bacteria. At the end of 4th day, the values at the end of 4th day for mint group patients decreased to 48.78% for 1st patient, 56.6% for 2nd patient, 48.4% for 3rd group, and 49.4% for 4th patient. Comparing the oral flora at the end of 4th day to the values obtained before mouth washing, the inhibiting effect of mint on the aerobic microorganisms was determined. The inhibition of aerobic microorganisms after mint agitation is shown in the Table 2. In a previous study, it was reported that the number of S. mutans was higher in saliva samples taken from individuals, who have caries, when compared to those having not caries, and that the distribution of caries was directly proportional to the number of S. mutans(31). In the present study, it was determined that the number of relevant bacteria significantly decreased in patients’ oral flora from the first day to the last day, and that the antimicrobial effect of the plant that has been used was confirmed.

The microorganisms in the saliva excessively reproduce and play pathogen role when the oral care is insufficient; they might cause the cares and other diseases. The bacteria in flora can be identified as...
gram (+) coccus, gram (-) coccus, gram (+) mycobacteria and filaments, gram (-) mycobacteria and filaments, spirochetes, Treponema, protozoa, and Candida albicans. The streptococci are gram (+) facultative coccus chains. They are divided into groups as β-hemolytic, α-hemolytic, and non-hemolytic streptococci. Those causing infection in mouth and root canal are the α-hemolytic streptococci. Streptococcus mutans, which is one of α-hemolytic streptococci, are the main pathogenic microorganisms leading to caries. The activity of S.mutans oral flora is a factor that directly affects the incidence of caries. In oro-dental infections, the diversity of bacteria in microbial flora depends on the criteria for patient selection, difference of sampling location, cultivation methods, and geographical differences. In the present study, by using different herbal extracts for the patients having different oral floras, the common point is that all of the herbal extracts positively reduced the oral flora.

In orodental infections, the diversity of bacteria in microbial flora depends on the criteria for patient selection, difference of sampling location, cultivation methods, and geographical differences. In the present study, by using different herbal extracts for the patients having different oral floras, the common point is that all of the herbal extracts positively reduced the oral flora.

In the in vivo study carried out on the patient, the prewashing numbers of aerobic microorganisms isolated from the flora around the denture in mouth (prior to the washing) were reported to be 93, 85, 80, and 95, respectively. According to the isolation results, the highest score was that of KNS group, whereas the lowest score was that of S.aureus. In clove group, a decrease was observed in the total number of isolated aerobic bacteria on 4th day. The values measured at the end of 4th day decreased to 44.2% for 1st patient, 44.7% for 2nd patient, 48.7% for 3rd patient, and 46.3% for 4th patient. Comparing the unwashed oral flora and the oral flora on 4th day, the clove was found to decrease the number of aerobic microorganisms in the oral flora, as the other plants did. The inhibition of aerobic microorganisms after clove agitation is shown in the Table 3.

### Table 3: Aerobic Microorganisms After Clove and Chlorhexidine Rinse

<table>
<thead>
<tr>
<th>Clove (%)</th>
<th>Chlorhexidine (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P1</td>
</tr>
<tr>
<td>0.D</td>
<td>0.D</td>
</tr>
<tr>
<td>P1</td>
<td></td>
</tr>
<tr>
<td>0.D</td>
<td>0.D</td>
</tr>
<tr>
<td>P2</td>
<td></td>
</tr>
<tr>
<td>0.D</td>
<td>0.D</td>
</tr>
<tr>
<td>P3</td>
<td></td>
</tr>
<tr>
<td>0.D</td>
<td>0.D</td>
</tr>
<tr>
<td>P4</td>
<td></td>
</tr>
<tr>
<td>0.D</td>
<td>0.D</td>
</tr>
<tr>
<td>1</td>
<td>Total KNS; Enterococci spp.</td>
</tr>
<tr>
<td></td>
<td>Lactobacillus spp.</td>
</tr>
<tr>
<td></td>
<td>Candida spp.</td>
</tr>
<tr>
<td></td>
<td>Staphylococcus aureus</td>
</tr>
<tr>
<td></td>
<td>Isolated KNS; Staphylococcus epidermis</td>
</tr>
<tr>
<td></td>
<td>Non-Isolated KNS</td>
</tr>
<tr>
<td>2</td>
<td>Isolated Streptococcus spp.</td>
</tr>
<tr>
<td></td>
<td>Streptococcus mutans</td>
</tr>
<tr>
<td></td>
<td>Streptococcus salivarius</td>
</tr>
<tr>
<td></td>
<td>Streptococcus oralis</td>
</tr>
<tr>
<td>TOTAL</td>
<td>93</td>
</tr>
</tbody>
</table>

P: Patient, 0.D: first day number of aerobic microorganisms before shaking. 4.D: fourth day number of aerobic microorganisms after shaking.

patient, 37.6% for 2nd patient, 34.4% for 3rd patient, and 38.4% for 4th patient. When compared the unwashed oral flora and the flora at the end of 4th day of washing, differently from other 3 plants, the chlorhexidine was found to effectively reduce the aerobic microorganisms in the oral flora. The inhibition of aerobic microorganisms after chlorhexidine agitation is shown in the Table 3. Chlorhexidine is the leading antimicrobial agents, which have a wide spectrum and are used for decreasing the oral pathogen level\(^{(13)}\). In dentistry, the addition of chlorhexidine into mouthwashes, dental gels, and polishers is for reducing the oral S. mutans level. In the previous studies, it was reported that the gels and polishers containing 1% chlorhexidine significantly reduced the levels of S.mutans on dental restorations\(^{(33)}\). In our study group, significant reduction was observed in the oral floras of individuals, who have used chlorhexidine. After shaking the whole plant extract of inhibition for the days shown in the Figure 2.

Since it is a facultative and anaerobic gram (+) test microorganism leading to resistant apical inflammation and present in monocultures, E. faecalis is a pathogen microorganism that is not desired in oral flora.\(^{(9)}\) E. faecalis was inhibited at various concentrations of herbal extracts used in the present study. The highest inhibition was observed with the clove, regardless of the difference in conditions. In a previous study on oral pathogens, Pinheiro et al.\(^{(9)}\) isolated E.faecalis in 52.94% of root and canal treatments. This situation was explained with that the pathogens consume the nutrient in the environment because of pathogens' intense invasion by not letting other microorganisms to live. Since the increase in number of pathogens in the environment will prevent the development of probiotic flora, the use of medical plants is recommendable. In a different study, it was reported that the oral bacteria can feed from the tissue liquids\(^{(34)}\).

The polyphenolic content of green tea was reported to have inhibitory effect on many pathogen bacteria such as Helicobacter pylori, methicillin-resistant Staphylococcus aureus, Streptococcus mutans, Streptococcus sobrinus, Salmonella typhi, Shigella dysentery, Shigella flexneri, and Vibrio cholera\(^{(35)}\). Moreover, these polyphenols were reported to be effective.
Numerous benefits of green tea on human health, which were shown, concentrated the interest on the effects of green tea on oral and dental health, and increased the number of studies on this subject(36). In their study on the effects of Iran black tea and green tea on S.mutans, Naderi et al. reported that Iran black tea concentrations at 100 mg/ml and higher and Iran green tea concentrations at 150 mg/ml and higher inhibited S.mutans(37). In their study on the effects of green tea on virulence activity of S.mutans, Xu et al. reported that the epigallocatechin gallate content of green tea showed antimicrobial activity against S.mutans and also suppressed the virulent factors related with the development of caries(29).

Another benefit of polyphenol content of green tea is that they prevent the adhesion of microorganisms on the hard tissues of tooth. Thus, they prevent the formation of dental plaque and help with recusing the acid production of microorganisms on the tooth surface. In the human body, there are many pathogen microorganisms during the entire life. The microorganisms in oral flora settle and live in host without leading to any harmful change(38).

In saliva, there are various antimicrobial substances. The most important one among them is the lysozymes. They play important role in natural resistance against the infection. They are effective against Neisseria, Mikroccocus, Klebsiella, Streptococcus, Staphylococcus, and Mycobacterium strains. The changes in lysozyme activities in saliva depend on the changes in mucoid-polysaccharides. The lysozymes influence the mucoid-polysaccharide content of bacterium cell. Lysozymes disintegrate the sensitive bacteria and can prevent the reproduction of bacteria without demolishing the cell. Many bacteria in the normal flora were reported to be resistant to lysozyme. For this reason, it is assumed to be less effective on the normal oral micro flora(37,38).

4. CONCLUSION

As a result, oral hygiene which is important in oral and dental health; It is a social issue that is important in our society and other developing countries. In our study; we have investigated the effectiveness of green tea, mint and clove plants on oral pathogens found in alternative medicine field and reached the conclusion that antimicrobial activities are effective. The prevalence of the obtained bacterias changes when the isolated bacterium is examined. This may be attributed to individual factors as well as nutritional habits, genetic factors, personal hygiene, socio-economic status and ecological factors. The formulations of the
rinse water can be activated by adding our research plants; it is also thought that the work in this subject should be increased further.

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