The Difference In Anti-Bacterial Activity Between Basil Leaf (Ocimum Sanctum) Essential Oil And Chlorhexidine Gluconate Towards Enterococcus faecalis

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Abstract
Chlorhexidine gluconate is a commonly used irrigation agent for root canal treatments. However, it is ineffective towards Enterococcus faecalis because these bacteria possess the ability to enter deeper layer of tissue beyond dentinal tubules. The increase of bacterial resistance towards synthetic agents has encouraged a few researchers to investigate the anti-bacterial properties of herbs as irrigation agents for root canal. Over time, there has been an increase in usage of medicine from natural sources. According to World Health Organization, plants are potential sources to the discovery of new medicine. Medicine obtained from plants are also safer compared to medicine obtained from basil. Basil (Ocimum Sanctum), is a herbal plant with a characteristic aroma that is commonly used as an appetizer. It possesses anti-bacterial, anti-fungal and anti-viral properties. Essential oil obtained from basil possess high levels of eugenol, which plays a major role in its anti-bacterial property. This research was carried out to investigate the anti-bacterial properties of basil leaf essential oil compared to chlorhexidine gluconate towards the growth of Enterococcus faecalis ATCC 29212. Initial procedures were to extract the essential oil from basil leaves through distillation. Results from phytochemical tests show that basil contains phenol, flavonoid, triterpenoid saponin, tannin with negative results on steroids. Bacterial tests in this research adapted the microdilution method by measuring Minimum Inhibitory Concentration (MIC). Results from this research showed that the MIC value for basil leaf essential oil was 31.25 ppm while the value for chlorhexidine gluconate was 0.49 ppm. Therefore, it can be concluded that essential oil from basil leaves possess anti-bacterial effects but are lower than that of chlorhexidine gluconate towards Enterococcus faecalis ATCC 29212.

Keywords: Ocimum Sanctum, Anti-bacterial activity, Enterococcus faecalis

Background
The success of endodontic therapies highly depend on the eradication of infection-causing microorganisms from the root canal.⁵ Enterococcus faecalis is one such gram-positive cocal bacterium that is present in the root canal due to failures in endodontic therapies. They are also present in necrotic pulp tissue.² Ideal root canal medications should possess properties such as bio-compatibility, easy to clean, does not cause tooth discoloration nor interfere with the process of obturation.⁶ The increase of bacterial resistance towards synthetic agents has encouraged a few researchers to investigate the anti-bacterial properties of herbs as irrigation agents for root canal. Over time, there has been an increase in usage of medicine from natural sources. According to World Health Organization, plants are potential sources to the discovery of new medicine.⁵ Medicine obtained from plants are also safer compared to medicine obtained from basil. Basil (Ocimum Sanctum), is a herbal plant with a characteristic aroma that is commonly used as an appetizer. It possesses anti-bacterial, anti-fungal and anti-viral properties. Essential oil obtained from basil possess high levels of eugenol, which plays a major role in its anti-bacterial property. This research was carried out to investigate the presence anti-bacterial property in basil leaf essential oil towards the growth of Enterococcus faecalis ATCC 29212. Initial procedures were to extract the essential oil from basil leaves through distillation. Results from phytochemical tests show that basil contains phenol, flavonoid, triterpenoid saponin, tannin with negative results on steroids. Bacterial tests in this research adapted the microdilution method by measuring Minimum Inhibitory Concentration (MIC). Results from this research showed that the MIC value for basil leaf essential oil was 31.25 ppm while the value for chlorhexidine gluconate was 0.49 ppm. Therefore, it can be concluded that essential oil from basil leaves possess anti-bacterial effects but are lower than that of chlorhexidine gluconate towards Enterococcus faecalis ATCC 29212.

Methods
This research was carried out to investigate the presence anti-bacterial property in basil leaf essential oil towards the growth of Enterococcus faecalis ATCC 29212.

Results
Table 1. Phytochemical Tests on Basil Leaf Essential Oil

<table>
<thead>
<tr>
<th>Sample</th>
<th>Phenol</th>
<th>Flavonoid</th>
<th>Steroid</th>
<th>Saponin</th>
<th>Triterpenoid</th>
<th>Tannin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basil leaf essential oil</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Legend:
(-) : Not Contained
(+): Contained

Table 2. MIC Value of Basil Leaf Essential Oil and Chlorhexidine Gluconate Towards Enterococcus faecalis ATCC 29212

<table>
<thead>
<tr>
<th>No</th>
<th>Sample</th>
<th>MIC value (Concentration ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basil Leaf Essential Oil</td>
<td>31.25</td>
</tr>
<tr>
<td>2</td>
<td>Chlorhexidine Gluconate</td>
<td>0.49</td>
</tr>
</tbody>
</table>

Discussion
The mechanism of flavonoid causes damage to the permeability of bacterial cell wall so that the cell membrane is undermined, followed by the discharge of intracellular substance and hamper bacterial motility.⁷⁻⁹ A few researches have shown that terpenoid is able to hamper bacterial growth by interfering with the formation of cell wall or cell membrane, causing them to not form completely or not being formed altogether.¹⁰ Saponin on the other hand, works to damage bacterial agent by obstructing reverse transcriptase enzyme and DNA topoisomerase and ultimately causes bacterial cells to not form.¹¹

Conclusion
Based on the results of the research and discussion, it can be concluded that basil leaf essential oil possesses anti-bacterial activity towards the growth of Enterococcus faecalis ATCC 29212, however, the MIC value of 31.25 ppm obtained from basil leaf essential oil was lower than that of chlorhexidine gluconate which has a MIC value of 0.49 ppm.

Reference
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