The Difference In Anti-Bacterial Activity Between Basil Leaf (Occinum 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 resistancy towards synthetic agents have encouraged a few researches to investigate the anti-bacterial properties of herbs as irrigation agents for root canal, one of which is basil.

Basil (Occinum 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. Basil essential oil is effective towards gram-positive and gram-negative bacteria.

This research was carried out to investigate the presence anti-bacterial property in basil leaf essential oil compared to chlorhexidine gluconate towards the growth of Enterecoccus 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) basil leaf essential oil towards Enterecoccus faecalis ATCC 29212 compared to chlorhexidine gluconate.

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 posses anti-bacterial effects but are lower than that of chlorhexidine gluconate towards Enterecoccus faecalis ATCC 29212.

Keywords :Occinum Sanctum, Anti-bacterial activity, Enterecoccus faecalis

Background

The success of endodontic therapies highly depend on the eradication of infection-causing microorganisms from the root canal.[1] Enterococcus faecalis is one such gram-positive coccal bacteria that is present in the root canal due to failures in endodontic therapies. They are also present in necrotic pulp tissue.[2]

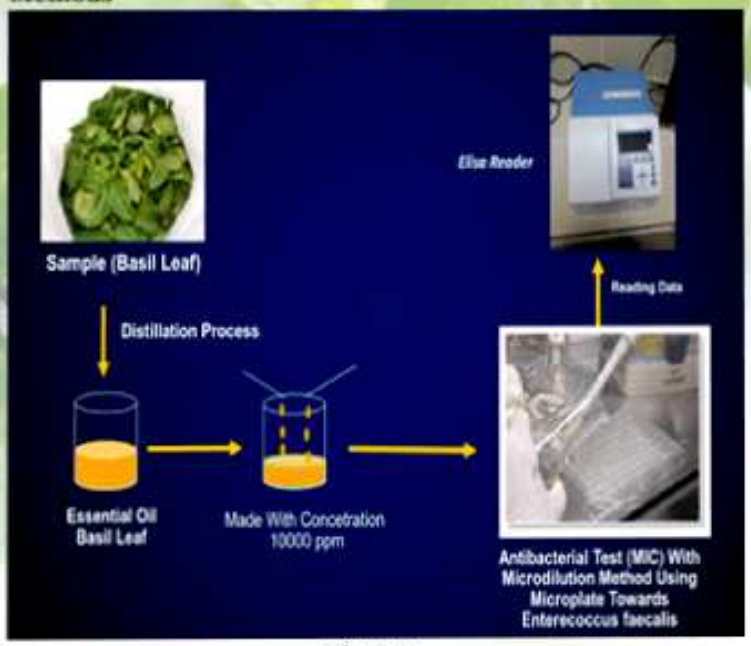
Ideal root canal medications should possess properties such as bio-compatibility, easy to clean, does not cause tooth discolouration nor interfere with the process of obturation.[3] The increase of bacterial resistancy towards synthetic agents have encouraged a few researches to investigate the anti-bacterial 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.[4] Medicine obtained from plants are also safer compared to medicine synthesized synthetically. An example of such products is basil essential oil, as it posses high anti-microbial ability, bio-compatible, anti-inflammatory, and anti-oxidant.

Basil posses anti-bacterial, anti-fungal and anti-viral effects.[5] This said anti-bacterial effect is from the eugenol which is the main component in essential oils found in basil leaves.[5,6] The content eugenol plays a big role in anti-bacterial properties of basil. Mann et al (2000) stated that essential oils found in basil leaves are effective towards both gram-positive and gram-negative bacteria.[5]

Objectives

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

Methods



Picture 1.
Distillation Process of Basil Leaf and Antibacterial Test Towards Enterecoccus faecalis

Results

Table 1. Phytochemical Tests on Basil Leaf Essential Oil

	Phenol	Flavonoid	Steroid	Saponin	Triterpenoid	Tanin
Basil leaf essential oil	+	+	-	+	+	+

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

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

No	Sample	MIC value (Concentration ppm)
1	Basil Leaf Essential Oil	31.25
2	Chlorhexidine Gluconate	0.49

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.[7,8,9]

A few researches have shown that terpenoid is able to hamper bacteria 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 cell cytoplasm by decreasing surface tension to increase permeability or leakage and causes intracellular substance to leak out.[11] The anti-bacterial mechanism of phenol stems from its ability to poison protoplasm, damage and puncture cell walls and coagulate bacterial cell proteins. Large molecules of phenols are able to deactivate essential enzymes in bacterial cells even in low concentrations. All in all, it causes damage to bacterial cells, denature proteins, deactivates enzymes and causes cell leakage. Tannin works as in anti-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 Enterecoccus 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.

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