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ORIGINAL: Evaluation of the Effectiveness of Cumin (Nigella Sativa) Seed Oil Extract as an Alternative Disinfectant of Dental Surfaces

Mohammadreza Moaddeli	Department of Oral and maxillofacial surgery, School of Dentistry, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.
Abdolmehdi Araghizadeh	Department of Endodontics, School of Dentistry, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.
Ehsan Shabani	Student Research Committee, School of Dentistry, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.

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Correspondence:
Ehsan Shabani, Student Research Committee, Faculty of Dentistry, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.
Email: dr.ehsan.b@gmail.com
ORCID: 0000-0002-7263-5422

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ABSTRACT

Introduction: Cumin (Nigella Sativa) seed oil extract has some ingredients which have antimicrobial effects. The essential oils present in cumin act as antimicrobial agent and it influence on different type of Gram-negative and Gram-positive bacteria and also viruses, parasites and fungi. This study aimed to investigate the antimicrobial properties of cumin extract in disinfecting dentistry surfaces.

Material and Methods: This study was performed experimentally and had three groups of cumin extract, Deconex and control group. For each of these groups, 12 culture media were prepared and we counted the colonies created in 24 hours and 48 hours and significance level was assessed using SPSS software and t-test.

Results: At 24 hours, there was a significant difference between the bacterial colony counts of the petri dishes from Cumin Seed (Nigella Sativa) Oil Extract at 5.83 and the Deconex at 0. And at 48 hours, there was also a significant difference since the bacterial colony count on the petri dishes with Cumin (Nigella Sativa) Oil Extract was too many to count and a 0.83 bacterial colony count for the petri dishes with the Deconex.

Conclusion: The Cumin (Nigella Sativa) seed oil extract is not suitable to use as an alternative disinfectant of dental surfaces lonely. But some of its ingredients such as thymoquinone and hydroquinone can be used to produce a disinfecting solution.

Introduction

Before any dental procedure is carried out, it is an absolute must that every dentist practice the correct process of infection control. Sterilization of instruments alone is not a sufficient guarantee that dentists and patients will not be susceptible to dangerous microorganisms. It is of great importance that dental practitioners take the process of infection control seriously so that the chance of acquiring certain diseases will be prevented (1). Any surface that has been in contact with a patient's expectorates is considered to be a carrier of infectious microorganisms. Therefore, it is a need to do disinfection before and after a dental procedure so as to protect the patient and the dentist (2).

There are different requirements concerning disinfection on various surfaces of the dental operatory. It depends upon the rating of patient contact and potential for contamination. Any surface that may come in

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contact with the patient or the patient's secretion is considered as a potential carrier of infectious organisms. There are two ways in which the operatory may be disinfected. One of which is to wipe all surfaces with a hospital-grade disinfectant solution or covering surfaces with protective shields and changing it between patients. It has been found that many chemical disinfectants, in certain concentrations, which have chlorine and glutaraldehyde compounds are used on surfaces to prevent the transfer of hepatitis viruses (3).

In a study conducted by Abu-Al-Basal, indicated that fixed oil of Cumin (Nigella Sativa) seeds increases the healing of staphylococcal-infected skin trough reducing WBC counts, inflammation and local infection, and bacterial expansion. These effects provide scientific basis for the use of Nigella sativa in traditional medicine to treat skin infections and inflammations. It therefore concludes that cumin has antimicrobial properties which can potentially be utilized as a surface disinfectant (4).

The aqueous extract of Cumin has been reported to inhibit the growth of pathogens namely Escherichia Coli, Staphylococcus Aureus, Salmonella Species, Bacillus Cereus and Aspergillus Niger (5, 6).

Thymoquinone known as constituent of Cumin (Nigella Sativa) which have the most active antimicrobial effect, also has different beneficial properties. The essential oils present in cumin act as antimicrobial agent and it influence on different type of Gram-negative and Gram-positive bacteria and also viruses, parasites and fungi (7).

This study is focused on the antimicrobial property of Cumin (Nigella Sativa) seed extract as it can be known as a surface disinfectant.

Methods

The experimental method of research has been used in this study. Two sets of subjects have been compared in terms of the efficacy of the Cumin Seed Oil Extract and surface disinfectant (Deconex, Novin Pak Shargh Chemical. Iran). The bacterial count results have been compared. Quantitative research was observed as it elicited numerical data from the bacterial counting through colony forming unit.

One hundred percent pure Cumin Seed Oil had been prepared from Centro Escolar University, Philipinnes, used in this study.

Sampling

Purposive sampling has been utilized in this research. The researchers randomly chose a dental module that was newly used from the Oral Surgery Section and got a sample from its cuspidor through swabbing. Afterwards, the researchers cultured the bacteria from the dental cuspidor and had it incubated for 24 hours.

Method of preparation of bacterial suspension

We prepared the materials to be used in making the Tryptone Soy Broth (TSB) for sub culturing of pathogens needed in the experiment. By using an analytical balance, then we put the 12 grams of Tryptone Soya Broth in a beaker and added 400 mL of distilled water. Stirring of the two mentioned ingredients has been done until it has dissolved in the water. The mixture has been heated in the halogen hot plate and automatically stopped once the highest temperature is reached then It was stirred until the broth was totally dissolved. The mixture has then been placed in one Erlenmeyer flask.

Five test tubes has been labeled as A, B, C, D and E. Then 5 ml of the mixture (Tryptone Soy Broth) has then been distributed in test tube A. Each of test tube B, C, D and E was containing 9 ml of distilled water already for the process of serial dilution of bacterial culture. Cotton swabs has then been placed in test tube A with TSB mixture and was incubated for 24 hours. Preparation of the test tubes in a test tube rack and has then been arranged from test tube A containing the bacterial culture from the swabbing of the dental cuspidor and test tubes B to E with 9ml of distilled water each.

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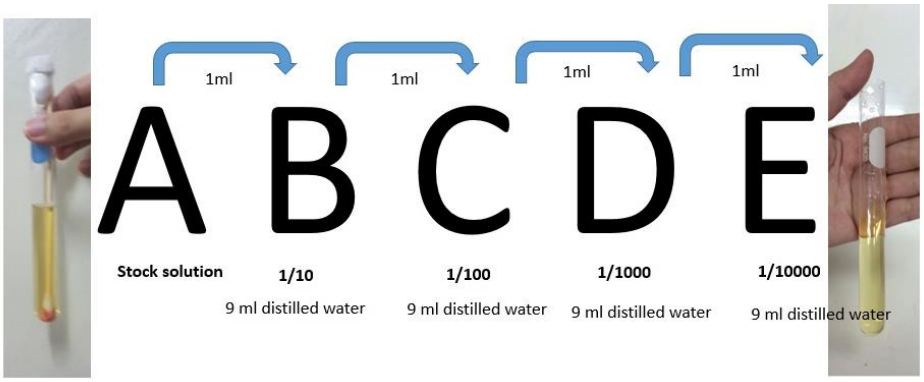

Figure 1. Process of serial dilution

From test tube A 1 ml has been transferred to test tube B using a pippete and was mixed. 1 ml from test tube B has been transferred to test tube C and was also mixed. From test tube C 1 ml was then transferred to test tube D. Lastly, 1 ml from test tube D has been transferred to test tube E.

Growth medium preparation

The materials to be used in making the Trypticase Soy Agar (TSA) was then prepared by using an analytical balance. We weighed 17 grams of Trypticase Soy Agar then we placed the 17 grams of Tripticase Soy Agar in an Erlenmeyer flask and 400 ml of distilled water was added and Stirring of all mixture was done until dissolved. The mixture was then heated in the halogen hot plate and automatically stopped once the highest temperature was reached. Stirring of the broth was done until dissolved. The mixture was then transferred in a 500 mL Erlenmeyer flask and autoclaved for 40 to 45 minutes. The cooled down prepared agar was then placed in 36 petri dishes.

Measuring the antibacterial properties

Then 12 petri dishes were labeled as Negative Control, another 12 for Cumin Seed Oil and 12 for Deconex. 1 ml from test tube E was then placed in each petri dish and pour plate method was then done. 1 ml from the cumin oil extract was placed and gently mixed in 12 petri dishes labeled Cumin Seed and 1 ml of a Deconex was distributed in the 12 petri dishes labeled as Deconex and was also mixed. The prepared Trypticase Soy Agar (TSA) was then poured in both petri dishes. The dishes was gently moved in three dimensions to mix the culture and the medium thoroughly and to ensure that the medium had covered the plate evenly and the plate was then allowed to solidify. The plate was then taped closed and incubated in an inverted position at 35-37 ˚C for 24 hours and 48 hours. Colony forming unit test was then conducted for the petri dishes incubated for 24 hours and also on the following day for the petri dishes incubated for 48 hours. The viable bacteria present in each petri dishes was then counted and the findings were recorded.

Significance level was assessed using SPSS software and t-test.

Results

The results of this study, which investigated the antimicrobial properties of Cumin seed oil extract in comparison with Deconex, can be seen in ***Table 1***. The bacterial count on the petri dishes with the application of Cumin (Nigella Sativa) Seed Oil Extract after 24 hours had an average of 5.83 bacterial colonies formed. And after 48 hours, the bacterial colonies formed were too many to count. There were no bacterial colonies formed on the petri dishes with the application of the Deconex after 24 hours. However, there was an average of 0.83 bacterial colonies formed on the petri dishes after 48 hours. In the control group, 161.16 colonies were observed on average in 24 hours and the number of colonies could not be measured in 48 hours.

At 24 hours, there was a significant difference

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Table 1. Bacterial colony count in all groups after 24 and 48 hours

	Cumin Seed Oil Extract		commercially available disinfectant		Negative Control	
	24 hours	48 hours	24 hours	48 hours	24 hours	48 hours
A	0	301	0	0	217	-
B	0	37	0	0	177	-
C	3	8	0	5	273	-
D	8	29	0	0	34	-
E	10	35	0	0	178	-
F	14	301	0	0	88	-
Average	5.83	118.5	0	0.83	161.16	-

between the bacterial colony counts of the petri dishes from Cumin Seed (Nigella Sativa) Oil Extract at 5.83 and the Deconex at 0 and therefore was not comparable. And at 48 hours, there was also a significant difference since the bacterial colony count on the petri dishes with Cumin (Nigella Sativa) Oil Extract was too many to count and a 0.83 bacterial colony count for the petri dishes with the Deconex and therefore was not comparable.

Table 2. The comparison of the bacterial colony counts in cumin seed oil extract and the Deconex at 24 hours

SAMPLES	MEAN	SD	P-VALUE	SIG
Cumin	5.83	4.92	0.027< 0.05	Significant
Commercially Available Disinfectant	0			

Table 3. The comparison of the bacterial colony counts in cumin seed oil extract and the Deconex at 48 hours

SAMPLES	MEAN	SD	P-VALUE	SIG
Cumin	118.5	113.62	0.049< 0.05	Significant
Commercially Available Disinfectant	0.83			

Discussion

In this study we showed that cumin seed oil extract has antimicrobial effects but this property is not enough that we could use cumin seed oil as an alternative disinfectant of dental surfaces. In many studies which aimed to analyze the cumin seed oil, it has been approved that cumin seed oil have some ingredients such as thymoquinone and hydroquinone that could have antimicrobial effects (7-15).

Most antimicrobial activity of cumin seed oil had been reported on mannheimia haemolytica and gram-negative bacteria(14). Aljabre et al showed cumin seed oil has antimicrobial effect on antibiotic-resistant microorganisms and both gram negative and gram-positive bacteria (16).

Nikan et al approved that cumin seed oil can effect on Staphylococcus aureus and Due to its anti-Staphylococcus aureus effect, it is possible that the effect of black seed oil extract on the bacterial cell membrane (13). Considering the antimicrobial effects of black seed and also its antifungal effect, it is possible that this plant has growth inhibitory effects on eukaryotes and prokaryotes (17).

It is an annual plant and grows widely in Asia and Eastern Europe. In India and the Middle East, this plant was used for various treatments such as asthma, bronchitis, rheumatism, fever and eczema (7, 8). Studies on the extract of this plant have shown that the substances in this extract called thymoquinone and hydroquinone have antibacterial properties and this has led to the widespread use of this plant in different communities (7, 11, 18).

As it shown in this study and previous studies, the Cumin (Nigella Sativa) seed oil extract has some ingredients that cusses antimicrobial effects. These ingredients such as thymo-quinone and hydroquinone have the most antimicrobial activity and they can be used to produce an effective disinfecting solution.

Conclusion

Considering the results of the current study,

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the Cumin (Nigella Sativa) seed oil extract is not suitable to use as an alternative disinfectant of dental surfaces lonely. But some of its ingredients such as thymoquinone and hydroquinone can be used to produce a disinfecting solution.

Conflicts of interest

There is no conflict of interest to declare.

Authors' contributions

The study was designed by 1, 2. The study data were collected by 3. Statistical analysis and interpretation of data were accomplished by 1, 2. Preparation of manuscript was performed by 1, 2 and 3.

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