

The effect of oil piper Cubeba on the cariogenic bacteria (streptococcus mutans and staphylococcus)

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Abstract:

The purpose of this study is to evaluate the effectiveness of oil piper cubeba plant (2%) alone and with Amber dentifrice on the bacteria cariogenic (Streptococcus mutans and Staphylococcus).

The oil of piper cubeba was isolated in this study by the use of piper cubeba plant. Two microorganisms were selected to examine the antimicrobial activity of the oil against dental caries. These microorganisms are Streptococcus mutans and Staphylococcus; both are isolated from dental plaque on the carious surface and from saliva. For the assay the turbidity method was used, using the mean of value f optical density to record the growth of bacteria.

The study showed that the oil of piper cubeba alone and with dentifrice reported significantly less mean value of optical density for both bacteria compared with the control read. That means it is effective in the controlling and preventing dental caries by reducing the growth of cariogenic microorganisms.

Keywords:

Oil piper cubeba plant, amber dentifrice, dental plaque.

Introduction:

The development of dental caries is a dynamic process of demineralization of the dental hard tissues by the products of bacterial metabolism, alternating with periods of demineralization. For caries to develop acidogenic (acid producing) bacteria must be present and mean must exist to contain the metabolic acid at the point where caries is to develop.

Dental plaque fulfills both of these functions. In dental plaque, there are more than (200) species of microorganisms. The great majorities are not directly involved in the caries process. The bacterial genera of

special interest in cariogenicity are the Streptococcus mutans and Staphylococcus^(1,2).

Mutans streptococci are now considered to be the major pathogenic bacterial species involved in the caries process^(3,4). Certain physiological characteristics of the mutans streptococci favor their position as a prime agent in caries. These traits include the ability to stick to tooth surface, production of abundant insoluble extra cellular polysaccharide from sucrose, rapid production of lactic acid from a number of sugar substrate, acid tolerance and production of intracellular polysaccharide stores⁽⁵⁾.

Many methods used to attack the dental plaque and especially the

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bacteria that are responsible for caries initiation to prevent and control dental caries. As the use of fluoride topically, in addition to other actions of fluoride to prevent dental caries, it reported to have the ability to inhibit glycolysis by interfering with the enzyme enolase. Also in high concentrations, it has been shown to interfere with bacterial metabolism⁽⁶⁻⁸⁾. Although many studies used chlorhexidine to combat cariogenic bacteria^(9, 10).

So, the purpose of this study is to evaluate the effectiveness for oil piper cubeba on cariogenic microorganisms (*Streptococcus mutans* and *Staphylococcus*) in vitro study.

Materials and methods:

The oil of piper cubeba material was prepared in this study by the pressed (5 KN) to 100 gram of dry cubeba plants to obtain (6.2 gram) of oil plant, or by extraction with ether yields about 8 percent of oleoresin. Two microorganisms were selected to examine the antimicrobial activity of the oil against dental caries. These microorganisms are *Streptococcus mutans* and *Staphylococcus*; both are isolated from the dental plaque on the carious surface and saliva. They were identified at the analytical laboratory in Al-Kanssa Hospital in Mosul. There were two samples, one pure cubeba oil alone, and other (2%) oil mixed with Amber toothpaste product.

For the assay the turbidity method was used. The procedure was done by dissolving (1) gram of the new compound (for each sample) in (9)ml distilled water, then the (1/100) concentration were prepared from the first preparation. Then, (0.1) ml for each sample were added to small vials containing (4) ml of the Tryptic Soya Broth medium and incubated by (0.1) ml of the bacterial suspension, incubated for (18)hours at (37°C) and the optical density of the culture were measured at (595nm) wavelength by the spectrophotometer (using CE1021,England), and the average were taken for triplicate of each sample. Also prepared a sample as control using distilled water instead of active ingredient to compare with the results of cubeba oil.

Results:

Table (1) showed the mean value of optical density for oil alone. The results revealed the effect of oil alone and on the cariogenic bacterial (*Streptococcus mutans* and *Staphylococcus*). There were very high significant reductions in bacterial growth of *Streptococcus mutans* compared with control (0.16 and 0.45), respectively, and significant reductions in bacterial growth for *Staphylococcus* compared with control (0.39 and 0.60), respectively.

Table (1): Mean and standard deviation of optical density value for

Microorganisms	Control	Cubeba oil	t
<i>Streptococcus mutans</i>	0.455 ± 0.01	0.16±0.021	8.3
<i>Staphylococcus</i>	0.601±0.02	0.397±0.022	2.16

Cariogenic bacteria for cubeba oil alone.

Table (2) showed the mean value of optical density for 2% cubeba

oil with toothpaste. The results indicated that there is high effect on

the cariogenic bacteria. Also, there were very high reductions in both bacterial growths compared with

control, although the mean value of the new formula was less than the mean value of the cubeba oil alone.

Table (2): Mean and standard deviation of optical density value for Cariogenic bacteria for 2% cubeba oil with dentifrice

Microorganisms	Control	Toothpaste+Cubeba oil(2%)	t
Streptococcus mutans	0.455 ± 0.01	0.056±0.039	9.8
Staphylococcus	0.601±0.02	0.168±0.04	7.81

Discussion:

Cubeba (*Piper cubeba*, family N.O.Piperaceae) is a climbing perennial plant, with dioecious flowers in spikes. The fruit is a globose, pedicelled drupe. Odour aromatic and characteristic- taste strongly aromatic and pungent and somewhat bitter. Cubebs should be freshly prepared as the oil evaporates; the powder is often adulterated with pimento. The cubeba in medicinal used in stimulant, carminative, much used as a remedy for gonorrhoea, after the first active inflammatory symptoms have been subsided; also used in leucorrhoea, cystitis, urethritis, abscesses of the prostate gland, piles and chronic bronchitis⁽¹¹⁾.

The reason for selection of these two microorganisms and especially *Streptococcus mutans* that there are many evidence in vitro, in vivo and animal experiments have shown that mutans streptococci, because of their metabolism, produce insoluble extra cellular polysaccharides and acid production. It is considered among the oral microorganisms with the strongest cariogenic properties^(1,12). The prevalence of caries and *Streptococcus mutans* has been reported in population from several countries⁽¹³⁻¹⁷⁾.

This study showed that the cubeba oil alone reduce the growth of streptococcus mutans (0.16) compared with the control reading (0.45) by

using optical density value. These differences were very high significant. Also reported a significant reduction in the growth of *Staphylococcus* (0.39) compared with control (0.60).

The results of the study showed that the high effect of cubeba oil (when mixed with the toothpaste in vitro). It showed that the mean values of optical density were reduced for both bacterial growths compared with control. For streptococcus mutans the mean value reduced from (0.45) for control reading to (0.056) for new formula with very high significance differences between them. Also the mean value of *Staphylococcus* was reduced form (0.6) to (0.16), respectively with very high significant difference between them.

From the finding of this study it is indicated that the oil cubeba alone and with toothpaste has a highly significant effect on the growth of cariogenic microorganisms that reflect the reduction in the mean value of optical density. That means the cubeba oil has a high effect on cariogenic microorganisms to prevent and control dental caries.

The increase of the effectiveness of cubeba oil with toothpaste is possible due to the presence of the fluoride in this toothpaste⁽¹⁸⁾ or the effect of other ingredients. Many studies reported the effect of fluoride on acidogenic bacteria, especially *Streptococcus*

mutans and *Staphylococcus* because of its relationship to dental caries⁽¹⁹⁻²¹⁾.

In conclusion, the cubeba oil reported high significant effect on cariogenic bacteria if used alone and increased their effectiveness when used with fluoridated dentifrice. So, further studies were needed to evaluate their effectiveness in vivo when used in dentifrice and to study the reason for increase their effectiveness against these cariogenic bacteria when used with fluoridated dentifrice.

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