



Tooth Friendly Chocolate

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Abstract:

One of the main constituents of chocolate is cocoa. Extracts from this cocoabean husk is said to contain certain anti-cariogenic substances. The cocoa bean husk has been shown to possess two types of mode of action, one showing antiglycosyltransferase (GTF) activity and the other antibacterial activity. They act against bacterial adhesion to the tooth surface and thereby decreasing the microbial growth. These substances are identified and are tried to incorporate in various forms for usage such as in tooth paste, mouth rinses and etc. The aim of this review is to highlight the recent trends about the evolution of cocoa bean extracts in dentistry and its usage in dental field.

Key words: Theobromine, cocoa bean husk, anti-cariogenic, plaque control.

INTRODUCTION :

Worldwide, 60–90% of school children and nearly 100% of adults have dental cavities (1). In spite of the increase in awareness about oral health care among people and recent advances in dentistry, there is still a high prevalence of caries (2). The reason for this being the food habits which has transformed from traditional food to junk food.

Chocolate being the king of junk foods, a common misconception is that, chocolate is the main culprit for causing dental caries. But the truth being, Among all cariogenic substance, chocolate does not top the list. Apart from this there is a good aspect of chocolate (refined chocolates are not considered), it contains cocoa powder which is derived from cocoa bean. This cocoa bean is said to contain substances which are anticariogenic (3).

Fluorides, as a preventive measure for dental caries is in use for more than many decades, but it has certain drawbacks such as toxicity, fluorosis etc. Apart from this there is controversy towards usage of fluorides by the anti fluoride lobbies. Austria, Belgium, Denmark, Finland, France, Germany, Iceland, Italy, Luxembourg, Netherlands, Norway, Sweden, and Switzerland are some of the countries, where anti fluoride lobby is in its strong hands (4). Caries vaccine on the other hand is in its preliminary stages of development. Even if it reaches the common market, the feasibility and affordability by common man, especially from developing countries is questionable.

In this era of modern medicine, antibiotics are used for anything and everything. This has not only reduced the problems, but has given rise to issues like antimicrobial resistance and allergic reactions to drugs. A safe alternative would be going back to the nature. Hence researchers are keen to identify anti-cariogenic substances with reduced ill effects. Cocoa bean extracts have been incorporated in preventing caries occurrence.

But these researches are still in the initial phase and are expected to gain importance in the near future. This review aims at giving a preliminary insight into cocoa bean husk and its uses in dentistry.

COCOA BEAN HUSK

The cocoa bean husk is a waste material in the chocolate industry known to contain a large amount of polyphenols and dietary fibers, such as cellulose, pectin, and lignin. Cocoa

bean husk is separated from the pre-roasted beans of theobroma cocoa. The cocoa bean husk has been shown to possess two types of cariostatic substances, one showing anti-glycosyltransferase (GTF) activity and the other antibacterial activity (3).

Theobromine is one of the major constituent in the cocoa bean. Theobromine (theobromide), which was previously known as xanthose, is a bitter alkaloid of the cocoa plant. It is found in chocolate, as well as in a number of other foods, including the leaves of the tea plant, and the kola (or cola) nut. It is in the methylxanthine class of chemical compounds which also includes the similar compounds theophylline and caffeine. Cocoa beans naturally contain approximately 1–4% theobromine. Cocoa powder can vary in the amount of theobromine, from 1.2%–2.4% (5).

There are usually higher concentrations of theobromine in dark than in milk chocolate.

OTHER PRODUCTS FROM COCOA HUSK

Cocoa husk is commonly used as animal feed, in pelletized form. Cocoa bean husk contains potash and this is used in the manufacturing of soft soaps (6) and also as fertilizers for soil.

ANTICARIOGENIC EFFECT OF COCOA BEAN HUSK

Streptococcus mutans has been implicated as a primary causative agent of dental caries in humans. The microorganisms produce 3 types of glycosyltransferase (GTFB, GTFC, and GTFD), and synthesize an adherent and water-insoluble glucan from sucrose by their cooperative action, which causes the organisms to adhere firmly to the tooth surface (3). The adherent glucan also contributes to the formation of dental plaque, in which the accumulation of acids leads to localized decalcification of the enamel surface (7).

Cocoa bean husk extract is said to contain, higher molecular-weight polyphenolic compounds which is said to have strong anti-glycosyltransferase property. Apart from this it contains unsaturated free fatty acids, such as oleic and linoleic acids, which exhibit antibacterial activity against *S. mutans*. The cariostatic property of the cocoa bean husk is due to these biological active constituents (3).

There was a study done to identify the anticariogenic effect of theobromine by examining its ability to cause

remineralization of enamel lesion and it was concluded, that theobromine in an apatite-forming medium can enhance the remineralization potential of the tooth (8).

THEOBROMINE TOOTH PASTE

An invitro study by Sadeghpour has found that theobromine is better than fluoride(2). It is thought that the amount of theobromine in a one ounce dark chocolate bar has a better effect on tooth hardness than a 1.1% prescription sodium fluoride treatment, (9). They showed that at a concentration 142 times less than that of fluoride, the theobromine active had twice the protective effect on teeth. As said before, fluoride has so many disadvantages, including its irritation of the gastro intestinal mucosa, conversely theobromine was found to be readily absorbed by the gut, metabolized and cleared cleanly by humans(9).

Similarly there was another study conducted by the scientists of Tulane University regarding theobromine, which showed theobromine's effect on the crystalline structure of teeth has an additional benefit, when used in the same concentration of sodium fluoride that is generally used in the tooth paste, it was seen that theobromine was better in its action (10).

APART FROM ANTI CARIOGENICITY

Cocoa bean husk extract rinse is highly effective in reducing mutans streptococci counts and plaque accumulation when used as mouth rinse by children. It can feasibly be incorporated in chocolates, chewing gums, mouth rinses, and beverages to prevent dental caries (11). Though no side effects were observed, the common complaint expressed by the children was regarding the bitter taste of the rinse. Addition of noncariogenic sugar substitutes should make it more acceptable, especially for children.

There are few studies comparing chlorhexidine mouthrinse versus cocoa bean husk extract mouth rinse as antimicrobial agent (12). The results show that there was significant reduction in streptococcus mutans counts in saliva at all follow-up intervals for both mouthrinse groups. However, there was no significant difference in reduction of streptococcus mutans counts in saliva, between chlorhexidine mouthrinse group and cocoa bean husk extract mouthrinse group.

Hence cocoa bean husk extract mouth rinse can be used as mouth rinse as an alternate to chlorhexidine mouth rinse as they both have same antimicrobial effect and evades the side effects of later.

EFFECT ON PERIODONTITIS

Oxidative stress affects the progression of periodontitis. Cocoa is a rich source of flavonoids with antioxidant properties, which could suppress gingival oxidative stress in periodontal lesions. Consuming a cocoa enriched diet suppressed gingival oxidative stress and periodontal inflammation in an animal study.

CONCLUSION

The research on theobromine and its anti cariogenic effect is in its nascent stages. The strength of evidence of its effectiveness against the gold standard, such as fluoride is very low because of the lack of randomized controlled trials both in vitro and in vivo. If in future this proves to be beneficial and cost effective, then it could open a new era of approach to prevention.

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