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The Use of Walnut Tree Bark Powder as a Teeth Whitener

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Abstract

The chemical changes that may occur with carious destruction of enamel lead to unacceptable appearance of teeth. For males and females the appearance of teeth is of most importance, therefore they should take care with their teeth. The cleaning and whitening processes are expensive and may be harmful for enamel of teeth, so this research includes the whitening of teeth by using natural product containing toothpaste. The powdered bark of walnut tree has been used as whitening material in four forms and these are tested on 40 volunteers with stained teeth in dentist clinic. The four products were powder only. Powder mixed with toothpaste, condensed aqueous extract and granules of the product. The percentage of the powder in the paste was 5%, the mixture is homogenized by using mortar and pistil and the pH is tested and calibrated by pH meter to 6.5 which is the acceptable medium for mouth and is included the normal range of saliva pH. The product is examined by brushing gently for two minutes after the brushing for same period by toothpaste without the powder. Walnut bark contains high quantities of minerals particularly manganese, and contains important subgroup of polyphenolic compound called ellagitannins which have antibacterial effects and antioxidant properties. The differences before and after brushing with powder were highly significant.

Keywords: Toothpaste. Walnut bark. Teeth whitener.

Introduction

Enamel is the most mineralized part in the body, leading to form thin, very hard, translucent layer and calcified tissue that cover the crown of the tooth^[1]. The thickness and the hardness of enamel vary from tooth to other and from person to other one. The hardness of enamel is explained by its composition from inorganic materials 95-98% calcium and phosphate ions that form hydroxyapatite crystals (fig. 1)^[2,3]. These crystals also contain trace minerals like strontium, magnesium, lead and fluoride. Enamel contains specific proteins called enamelin which tend to bind hydroxyapatite crystals^[4]. Enamel is permeable so the fluids can move and diffuse. This permeability may affect the density and the hardness of enamel by demineralization which is the loss of calcium and phosphate ions when pH decreases less than 5.5 so the oral medium becomes acidic^[5].

The binding of fluoride ions with apatite occurs by filling the hydroxyl vacancies or by displacing hydroxyl ions. Because of the high charge density presents on fluoride ions, these ions close and fit with calcium ions

in the triangles of apatite leading to stabilize the crystal structure^[7]. The binding of carbonate occurs by replacing calcium or phosphate ions, and the replacement depends on the development of crystal^[8].

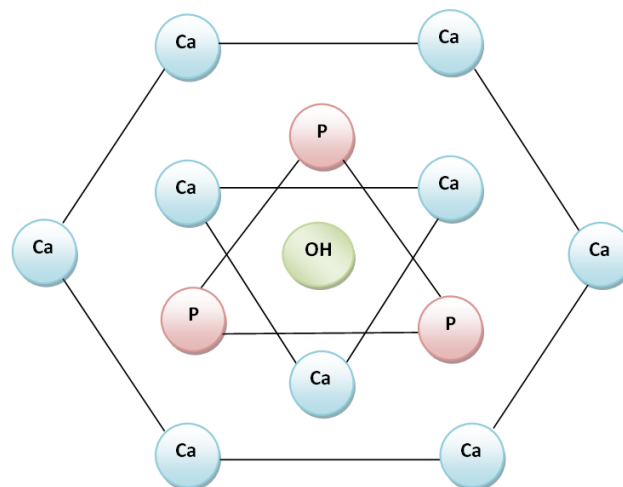


Figure 1: Crystal structure of hydroxyapatite^[6].

Calcium ions can also be replaced by magnesium ions in the surface of crystal^[9]. Carbonate and magnesium

ions incorporation have a positive synergistic effect on hydroxyapatite by increasing acid solubility of apatite mineral^[10]. Chloride, sodium and lead may be present in the structure of apatite^[11]. Organic materials are also present in a low concentration in the structure of enamel in a form of small peptides and amino acids distributed in the mature tissues^[12]. Enamel also contains a distinct type of protein called enamelin which comprises 10% of the total enamel protein and involved in amelogenesis^[13,14]. Mutation in the gene ENAM that is responsible for enamelin formation can cause amelogenesis imperfect^[15].

Materials and Method

All reagents used were of high purity. The samples are the walnut tree bark. The bark pieces were collected and rinsed with distilled water three times and dried in oven at 40°C. The bark pieces after drying were powdered by stainless steel grinder three times until fine powder was produced. The powder is stored in a polyethylene container until use. The practical procedure included four parts: the first part is the aqueous extraction of the sample by continuous extraction using Soxhlet for 24 hours, the extract is condensed by rotary evaporator then used as a crude extract in the whitening process. The second part is the mixing of powder with ordinary toothpaste and packaging the mixture to be examined. The third part is the formation of granules by mixing the powder with toothpaste and drying the mixture then convert it to granules. The fourth part is the use of powder only. The four products were tested on 40 volunteers in dentist clinic and the teeth were imaged before and after the whitening. The whitening effect of the products has been tested by two ways once by brushing and the second way by using micro motor instrument (10000 rpm) with soft brush. To neglect the effect brushing and toothpaste or the mechanical cleaning effect of device, the teeth of volunteers were brushed by toothpaste if they use the whitener by brushing and were cleaned by micro motor for those that use the whitener by micro motor device. The percentage of the powder in the paste was 5%, the mixture is homogenized by using mortar and pestle and the pH is tested and calibrated by pH meter to 6.5 which is the acceptable medium for mouth and is included

the normal range of saliva pH. The modulation of pH was performed by the addition of sodium carbonates and measuring the pH by pH meter. Chromascop shade guide (fig. 3) is used to compare between teeth before and after whitening processes.

Results and Discussion

The effect of whitening for the four products was examined in a dentist clinic by two ways the first one by brushing and the second by micro motor device at 10000 rpm with soft brush. Three of products showed good results of whitening except the condensed extract, the others have a high effect of whitening. The highest effect of whitening was for the powder only without additives but have not favorable and pungent taste and the pH cannot be controlled easily. The effect of powder containing toothpaste was high and the pungent taste is reduced and the pH can be easily controlled. The effect of granules was less than the powder containing toothpaste despite the granules was made by mixing with toothpaste, this can be explained according to the consistency of the product. The two ways of whitening showed the same results this means that there is no effect for the mechanical cleaning and the brushing is easier. The whitening persists for two months for those that keep care the teeth (fig. 2). The brushing period was three minutes and the results were for one use only. The effect of whitening may be explained by the presence of carbonates, sodium, potassium, calcium, phosphorus, magnesium, iron, copper, manganese, and zinc ions in the bark of walnut tree, all of these ions and molecules involved in the structure of hydroxyl apatite of the enamel and aid in demineralization process of enamel. Magnesium ions are located in the surface of the apatite crystal which has a stabilizing effect on the apatite lattice. Magnesium and carbonates have a synergistic effect by their incorporation to the hydroxyapatite lattice and by the ability to increase the acid solubility of apatite mineral. The structure of the plant also contains important compound called ellagitannin which is polyphenolic compound and severe antioxidant and has antibacterial effect. This product whitener is natural has no chemical compound which make it distinct over the other whiteners.



Before

After

Figure 2: Images of some volunteers teeth before and after whitening.

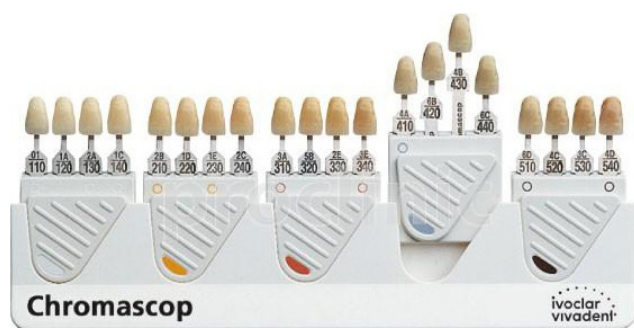


Figure 3: Cromascope used to compare between teeth before and after whitening

Conclusions

From the results and the period of whitening, the powder of walnut tree bark is a useful material for teeth whitening and has antibacterial effects because the presence of polyphenolic compounds. The paper discusses and treats important problem for males and females which can be solved in other expensive and harmful ways. The principle of this research depends on the use of natural products instead of chemicals so this whitener is safe to use.

Conflict of Interest: Nil.

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Ethical Clearance:

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