"Research Article"

The Effect of 100% Watermelon (Citrullus lanatus) Extract on Tooth Discoloration with Rub Techniques

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ABSTRACT
Tooth color can change because of several factors that are needed for teeth whitening. Teeth whitening can be performed on vital and non-vital teeth. Home bleaching is a vital whitening treatment that many people choose because practice can be done at home. Bleaching agent used for home bleaching techniques is 10%-22% carbamide peroxide. However, carbamide peroxide has side effects on the oral cavity. So, several previous researches have examined natural ingredients that contain the ability to whiten teeth. One of them is 100% watermelon extract which is proven to whiten teeth by immersing. However, this method cannot be applied clinically, so the purpose of this research is to know the effect of watermelon extract on tooth discoloration with rub techniques application. This type of research is an experimental laboratory. 10 maxillary premolars were discolored which were divided into two groups (watermelon extract and 10% carbamide peroxide). Each group was given the treatment 3 hours per-day for 14 days. After the bleaching process, the teeth are cleaned and immersed in a solution of saliva. Before and after bleaching, they were measured with a shade guide and spectrophotometer. Data analysis used paired t-test and wilcoxon. The results of paired t-test on group 1 p=0.024 (p <0.05). The wilcoxon test results on group 2 with p=0.043 (p <0.05). Both have influence, but the application of 10% watermelon extract is lower than 10% carbamide peroxide. It can be concluded: 100% watermelon extract with rubbing techniques has an effect on teeth whitening. Although, lower than 10% carbamide peroxide.

Keywords: home bleaching, rub technique, watermelon extract

INTRODUCTION
In general, the color of permanent human teeth varies, such as yellowish white, grayish blue and grayish white. This is caused by the translucency of the enamel, the thickness of the enamel, the thickness of the dentin, and the color of the pulp 1. However, most people want bright colored teeth to improve their appearance so that when they smile they look beautiful and perfect 2. In certain circumstances the color of the teeth can change which can be caused by various factors such as extrinsic, intrinsic or a combination 3. Stains originating from extrinsics can be removed by scaling and polishing. However, extrinsic stains that have hardened and stains originating from intrinsic coloring require treatment, namely bleaching 4. Bleaching is a procedure to brighten the color of teeth. This aims to return the tooth color to normal. The bleaching procedure is carried out by applying an oxidizing agent or what is commonly known as a whitening agent which functions to oxidize organic pigments in teeth 1. There are two bleaching techniques, namely in office bleaching and home bleaching 2.

Home bleaching is a bleaching procedure that can be done at home, but still under the supervision of a dentist. This technique was introduced in 1989 by Haywood and Heymann. Applying the home bleaching technique is relatively easy and the percentage of treatment success is high. Apart from that, the cost of carrying out home bleaching treatment is
relatively affordable for the public. The home bleaching technique is effective and safe, the usage time is 14 days and the average usage of home bleaching treatment using 10% carbamide peroxide is 2-3 hours.

Carbamide peroxide is an ingredient used in home bleaching techniques with a concentration of 10%-20%. The effectiveness of the material used depends on the concentration of the material, where the higher the concentration, the faster it will produce whitening results. The reason for using carbamide peroxide as a home bleaching agent is because it is believed to be safer than hydrogen peroxide. However, in reality 10% carbamide peroxide still has an effect. There are side effects on the enamel surface, which can cause changes in microhardness on the enamel surface and previous research has shown that 10% carbamide peroxide has the same effect as 6% hydrogen peroxide, namely that both have a significant effect on reducing the hardness of the enamel surface. Teeth whitening agents with chemicals certainly have many other disadvantages. Apart from reducing the hardness of the enamel, it can make teeth more sensitive and if not careful in application can cause gingival irritation.

There are many side effects from chemicals for bleaching, several researchers are trying to research natural bleaching ingredients as a safer and cheaper alternative. Many fruits have been researched and can be used as an alternative natural bleaching agent, such as tomatoes, starfruit, strawberries and apples. In previous research, it was proven that 2 types of apple juice, namely Anna apple juice and Granny Smith apple juice, can whiten teeth because they contain malic acid. Apart from that, the study showed that the results were not significantly different from carbamide peroxide.

One useful plant is watermelon (Citrullus lanatus). Watermelon, which is included in the pumpkin group, has a sweet taste and also contains several ingredients that are good for health. In previous research, research was conducted on 100% watermelon fruit extract which compared its effectiveness with 10% carbamide peroxide by soaking the teeth for 56 hours. and the results were proven that the group whose teeth were applied with watermelon extract experienced a change in tooth color to become whiter after applying 100% watermelon extract because it contains malic acid and hydrogen peroxide which have a whitening effect on teeth.

However, this research cannot be applied clinically because the teeth or samples were treated by soaking for 56 hours. This of course cannot be done in a clinical setting. In the home bleaching technique, this technique is carried out independently by the patient at home by applying home bleaching material, namely carbamide peroxide, to an individual custom tray that has been made by the dentist, then the tray is placed in the mouth...
Apart from that, there are many types of various bleaching preparations, one of which is a whitening gel which is applied using a microbrush onto the surface of the teeth for 14 days. Apart from that, previous research has been carried out by applying natural bleaching ingredients, namely strawberry fruit paste and orange fruit paste. Lemon by applying it using a small brush to the surface of the teeth and has shown effectiveness in changing the color of teeth.

Therefore, in this study, 100% watermelon extract was applied so that it could be applied clinically and determine the effect of watermelon extract on changes in tooth color using the application technique.

**MATERIALS AND METHODS**

This research is an in vitro laboratory experimental research. The research was carried out at the UMY pharmaceutical technology laboratory for the manufacture of extracts and application of bleaching agents, while the measurement of tooth color was carried out at the UII textile technology laboratory. The samples used in the study were 10 post-extraction maxillary premolars with the inclusion criteria in this study being maxillary first premolars with intact crowns, no caries, no attrition and intact roots. The exclusion criteria in this study were maxillary first premolars with attrited crowns, caries and perforated roots.

All samples were discolored by placing them in a tea solution for 6 days. After the discoloration process is carried out, color matching is then carried out using a shade guide and tooth color is measured using a spectrophotometer.

The ten premolars used as research samples were divided into two groups with the same number, namely each group consisted of 5 teeth. Each sample is given a sign or serial number. Group 1 (serial numbers 1-5) consisted of 5 teeth smeared with 100% watermelon extract and group 2 (serial numbers 6-10) consisted of 5 teeth smeared with 10% carbamide peroxide by smearing. However, before applying the material, all samples were cleaned using water and a toothbrush.

<table>
<thead>
<tr>
<th>Sample Code</th>
<th>Shade guide</th>
<th>Spectrophotometer</th>
<th>Sample Code</th>
<th>Shade guide</th>
<th>Spectrophotometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR-1 *</td>
<td>B4</td>
<td>27.79*</td>
<td>SDR-1</td>
<td>A2</td>
<td>15.97*</td>
</tr>
<tr>
<td>DR-2</td>
<td>C3</td>
<td>25.88</td>
<td>SDR-2</td>
<td>B1</td>
<td>20.62</td>
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<td>DR-3</td>
<td>B2</td>
<td>12.93</td>
<td>SDR-3</td>
<td>B1</td>
<td>8.50</td>
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<td>DR-4</td>
<td>C3</td>
<td>22.35</td>
<td>SDR-4</td>
<td>A3</td>
<td>20.15</td>
</tr>
<tr>
<td>DR-5</td>
<td>C3</td>
<td>30.92</td>
<td>SDR-5</td>
<td>B2</td>
<td>18.91</td>
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</table>

<table>
<thead>
<tr>
<th>Sample Code</th>
<th>Shade guide</th>
<th>Spectrophotometer</th>
<th>Sample Code</th>
<th>Shade guide</th>
<th>Spectrophotometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR-68</td>
<td>C2</td>
<td>26.05*</td>
<td>SDR-6</td>
<td>B1</td>
<td>13.47*</td>
</tr>
<tr>
<td>DR-7</td>
<td>B2</td>
<td>16.93</td>
<td>SDR-7</td>
<td>A1</td>
<td>9.32</td>
</tr>
<tr>
<td>DR-8</td>
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<td>30.73</td>
<td>SDR-8</td>
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<td>13.51</td>
</tr>
<tr>
<td>DR-9</td>
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<td>13.30</td>
<td>SDR-9</td>
<td>B2</td>
<td>8.40</td>
</tr>
<tr>
<td>DR-10</td>
<td>C4</td>
<td>22.70</td>
<td>SDR-10</td>
<td>A1</td>
<td>13.76</td>
</tr>
</tbody>
</table>
materials were applied to each group. The time to apply the material is 3 hours a day, 2 hours in the morning and 1 hour in the afternoon for 14 days. After applying the bleaching agent 100% watermelon extract and 10% carbamide peroxide, the tooth samples were soaked in artificial saliva, but rinsed first using water and a toothbrush.

After the 14th day, the samples were color matched using a shade guide and tooth color was measured using a spectrophotometer. The results of measurements from the spectrophotometer were processed and analyzed using the paired t-test for normal data and Wilcoxon for abnormal data to see the effect of both materials in SPSS.

RESULTS

Table 1 is data on shade guide values and \( \text{dE}^*\text{ab} \) measurement results, both of which experienced changes in tooth samples before and after application of 100% watermelon extract.

Table 2 shows data on shade guide values and \( \text{dE}^*\text{ab} \) measurement results, both of which experienced changes in tooth samples before and after the application of 10% carbamide peroxide.

Table 3 shows the results of the paired t-test which states that there is an effect before and after application of 100% watermelon extract using the smearing technique.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Shapiro wilk</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extract watermelon (before)</td>
<td>0.541*</td>
<td>Normal</td>
</tr>
<tr>
<td>Extract watermelon (after)</td>
<td>0.123*</td>
<td>Normal</td>
</tr>
<tr>
<td>Carbamide peroxide (before)</td>
<td>0.919*</td>
<td>Normal</td>
</tr>
<tr>
<td>Carbamide peroxide (after)</td>
<td>0.844*</td>
<td>Not normal</td>
</tr>
</tbody>
</table>

Table 4 shows the results of the Wilcoxon test which shows that there is an effect before and after the application of 10% carbamide peroxide.

Table 4. Test data paired t-test

<table>
<thead>
<tr>
<th>Treatment</th>
<th>n</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extract watermelon (before)</td>
<td>5</td>
<td>0.024*</td>
</tr>
<tr>
<td>Extract watermelon (after)</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION

Based on tables 1 and 2, it shows that there was a change in the shade guide value and a decrease in the \( \text{dE}^*\text{ab} \) value in all samples, both in the group treated with 100% watermelon extract and 10% carbamide peroxide. For example, in sample DR-1 (*) there was a change from the B4(*) value to A2(*) and had a \( \text{dE}^*\text{ab} \) value before applying the extract of 27.79 (*) and decreased after applying 100% watermelon extract to 15.97 (*) and in the carbamide peroxide group, the DR-6 sample (*) had a change in the shade guide value from C2(*) to B1(*) and the spectrophotometer value before applying the carbamide gel was 26.05 (*) and decreased after applying the gel to 13.47 (*).

In this research, the description \( \text{dE}^*\text{ab} \) is the total value of light on an object that is illuminated by calculating the formula \( \text{dE}^*\text{ab} = (\text{dL}^*2 + \text{da}^*2 + \text{db}^*2)^{1/2} \). \( \text{L}^* \) is the light-dark coordinate. The values \( \text{a}^* \) and \( \text{b}^* \) are the chromatic coordinates of the object which has a color range of red – green and yellow – blue. Where +a indicates the direction towards red, -a indicates towards green, +b indicates towards yellow and -b indicates towards blue.

This is in accordance with the theory that the smaller the \( \text{dE}^*\text{ab} \) value, the smaller the color intensity reflected by the tooth surface and the spectrophotometer absorbs the smaller color intensity. This result is in accordance with previous research which shows that there is a change in color to brighter teeth which had been applied with longan flower honey and carbamide peroxide, which was indicated by a decrease in the \( \text{dE}^*\text{ab} \) value of. Other research that supports the results is research on 0.5% sodium hypochlorite in removing tea stains and the results prove that there is a decrease in the \( \text{dE} \) value *ab in the 0.5% NaOCl group in both the 5 minute and 10 minute groups and both were proven to be able to remove stains up to 98.5% and 106.9%. This is because...
chlorine is an oxidizing agent which is able to break double bonds to produce a white color.

The results of the paired t-test in table 4, using the SPSS system, show a significance value of 0.024 (*) which shows a p value <0.05, which means that there is an effect after applying 100% watermelon extract on changing the color of the teeth to become whiter. Several research journals support these results, such as previous research using the same alternative bleaching material, namely 100% watermelon extract, showing that 100% watermelon extract by soaking has indeed proven effective in changing the color of teeth to become whiter.

Apart from malic acid, watermelon also has other ingredients that can whiten teeth, namely hydrogen peroxide. This is based on the theory that hydrogen peroxide is a strong oxidizer which plays a role in breaking down long chain dark colored molecules into short chain molecules. Other fruits based on research Strawberry can whiten teeth. Strawberry is one of the natural ingredients that can currently be used to whiten teeth that have changed color. It contains ellagic acid and malic acid which can whiten teeth.

Table 5. test data wilcoxon

<table>
<thead>
<tr>
<th>Perlakuan</th>
<th>n</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbamid peroksid 10% (before)</td>
<td>5</td>
<td>0.043*</td>
</tr>
<tr>
<td>Carbamid peroksid 10% (after)</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Based on the average graph in Figure 1, it shows that the change in tooth color resulting from 10% carbamide peroxide using the smearing technique was higher than in the group that applied 100% watermelon extract using the smearing technique. This result is of course because carbamide peroxide is a bleaching agent that is usually used in home-bleaching techniques.

**CONCLUSION**

Applying 100% watermelon extract using a smearing technique 3 hours a day for 14 days has an effect on changing tooth color, although the effect is not higher than that of 10% carbamide peroxide.

**SUGGESTION**

Further research needs to be done to find out how much hydrogen peroxide and malic acid are contained in watermelon so that it is safe for the hard and soft tissues of the oral cavity.

Further research needs to be done on test animals using clinical simulations using smearing.

**REFERENCES**


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