

Original Research

The Effect Of Commonly Used Types Of Coffee Brands Available In Saudi Market On Teeth Staining: An In Vitro Study

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ABSTRACT

Aim: To evaluate the effect of commonly used types of coffee brands available in Saudi Arabia market on teeth staining. **Methods:** This is an in vitro experimental study. A total of 25 premolar teeth was used in this study. Teeth were soaked in four different types coffee brands for 2 minutes, 3 days, and 7 days. Color measurements were taken before immersion, followed by 2 minutes, 3 days, and 7 days after immersion by VITA Easy shade device, CIELAB measurement was used. Descriptive analysis was undertaken to present an overview of the findings from this sample. **Results:** Among the different four brands of coffee in which teeth were placed, maximum change in color was seen with Java Time, and minimum change was in Tim Horton brand. At 2 minutes after immersion, Starbucks coffee brand showed the highest color change among all brands. At both 3 days and 7 days after immersion, Java Time showed the highest color change from baseline among all brands. **Conclusion:** All coffee brands used in this study caused teeth discoloration. The effect of the coffee brands on the color change of the teeth depends on type, amount, and concentration of each brand.

INTRODUCTION

Facial attractiveness plays a key role in social interaction. It influences mating success, kinship opportunities, personality evaluations, performance, and employment prospects. With more people consuming coffee, many brands are available in the market. Although coffee puts morning smiles on our faces, it can affect the facial attractiveness 1. Tooth staining may be due to intrinsic and extrinsic factors. Extrinsic factors include staining by adsorption or absorption of colorants such as coffee, tea, nicotine, and beverages 2. The enamel of the teeth is the hardest substance in the human body, it is not flat and smooth. On the contrary, the tooth enamel contains microscopic pits and ridges that can hold particles of food and drink 3.

The staining potential of these beverages and solutions varies according to their composition and properties 4. One study showed the effect of commonly used types of coffee on surface micro hardness and color stability of resin-based composite restorations 5. Several previous studies used it to measure color change (ΔE) by comparing the values before and after immersing in a staining solution 6-7. Color evaluation by visual may not be a reliable method due to inconsistencies inherent in color perception and specification between observers. Instruments for color measurement include colorimeter, spectrophotometer, and digital image analysis. Spectrophotometer is the most reliable technique as it can potentially eliminate subjective errors in color assessment 8. The aim of this study was to evaluate the effect of commonly used types of

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coffee brands available in Saudi Arabia market on teeth staining.

MATERIALS AND METHODS

This is an in vitro experimental study on premolar teeth extracted for an orthodontic purpose which is both stain and caries free. The teeth were polished with prophylactic paste and stored in an isotonic 0.9 % saline to avoid dehydration. The four brands of coffee were taken daily from the store without adding sugar and left to set for room temperature using a thermometer. A total of 25 premolar teeth was used in this study. Teeth were equally distributed in five groups (Group 1: Starbucks; Group 2: Tim Horton's; Group 3: Dunkin Donuts; Group 4: Java Time; and Group 5: Control) and labeled on the root surface. Teeth were soaked in saliva for 2 minutes, followed by water for 1 minute and in coffee for 2 minutes, 3 days, and 7 days. Color measurements were taken before immersion (baseline), followed by 2 minutes, 3 days, and 7 days after immersion by VITA Easy shade device, CIELAB measurement was used. Statistical analysis was performed using SPSS version 22 (SPSS Inc., Chicago, IL, USA). Descriptive analysis was undertaken to present an overview of the findings from this sample.

RESULTS

Table 1 shows the mean values of color change (ΔE). Among the different four brands of coffee in which teeth were placed, maximum change in color was seen with Java Time, and minimum change was in Tim Horton brand. At 2 minutes after immersion, Starbucks coffee brand showed the highest color change among all brands. At both 3 days and 7 days after immersion,

	ΔE (2 Minutes)	ΔE (3 days)	ΔE (7 days)
Control	84.68	84.68	84.68
Starbucks	24.92	7.35	4.39
Tim Hortons	22.80	1.44	7.54
Dunkin Donuts	11.54	7.50	8.51
Java Time	7.49	14.08	9.17

Table 1. Mean values of color change (ΔE)

Java Time showed the highest color change from baseline among all brands.

Figure 1 shows a significant color change (ΔE) between 2 minutes and 3 days from baseline in Starbucks coffee brand. Tim Hortons coffee brand showed a significant color change (ΔE) between 2 minutes and 3 days from baseline; and 3 days and 7 days from baseline (Figure 2). Dunkin Donuts coffee brand showed no significant color change (ΔE) between different periods of time from baseline (Figure 3). Java Time coffee brand showed a significant color change (ΔE) between 2 minutes and 3 days from baseline; and 3 days and 7 days from baseline (Figure 4).

Figure 5 shows the comparison of color change (ΔE) of the four coffee brands at different periods of time from baseline. At 2 minutes after immersion, Starbucks coffee brand showed the highest color change, followed by Tim Hortons, Dunkin Donuts, and Java Time from baseline. At 3 days after immersion, Java Time showed the highest color change, followed by Dunkin Donuts, Starbucks, and Tim Hortons from baseline. At 7 days after immersion, Java Time showed the highest color change, followed by Dunkin Donuts, Tim Hortons, and Starbucks from baseline.

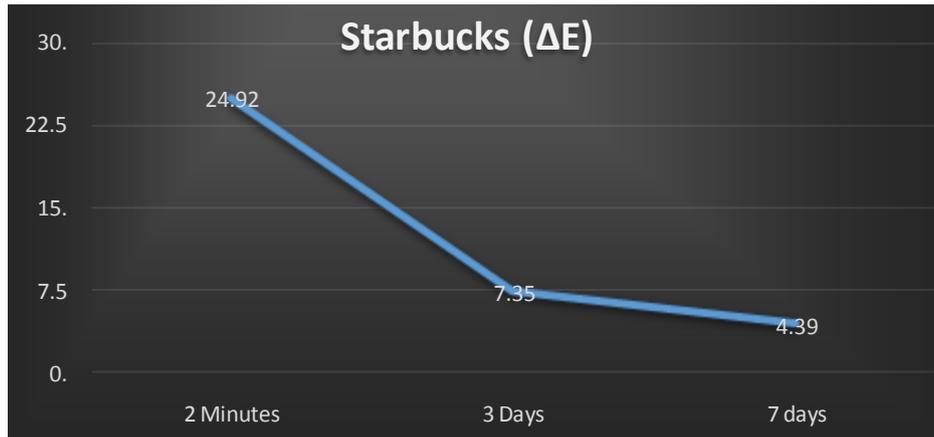


Figure 1. Mean values of color change (ΔE) of Starbucks coffee brand at different periods of time

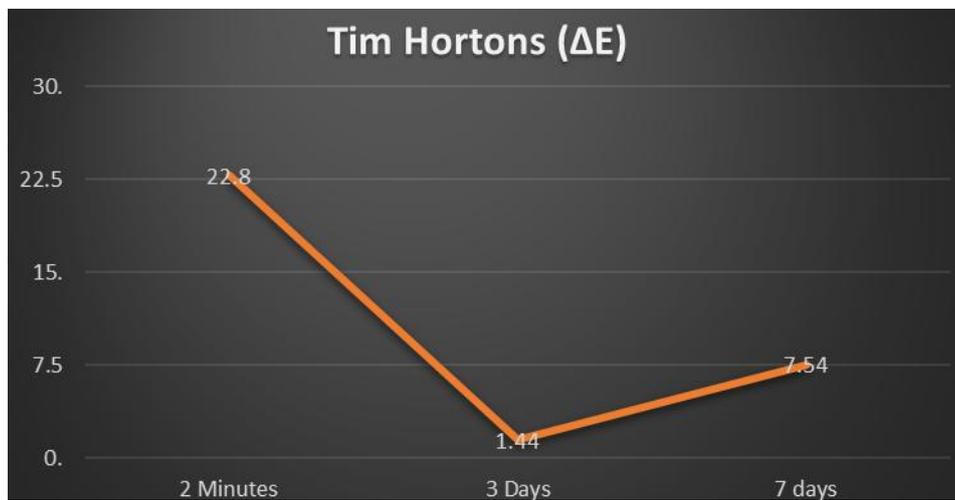


Figure 2. Mean values of color change (ΔE) of Tim Hortons coffee brand at different periods of time

DISCUSSION

The present study investigated the effect of commonly used types of coffee brands available in Saudi market on teeth staining using spectrophotometry. The groups were divided based upon the coffee brands. In the current study all teeth showed color change after immersion in the four types of coffee brand (Starbucks, Tim Hortons, Dunkin Dount, and Java

Time) at 2 minutes, 3 days, and 7 days of immersion from the baseline.

At 2 minutes after immersion, Starbucks coffee brand showed the highest color change and Java Time showed the least color change from baseline. On the other hand, at 3 days after immersion and 7 days after

immersion, Java Time showed the highest color change from baseline. This might be because of the

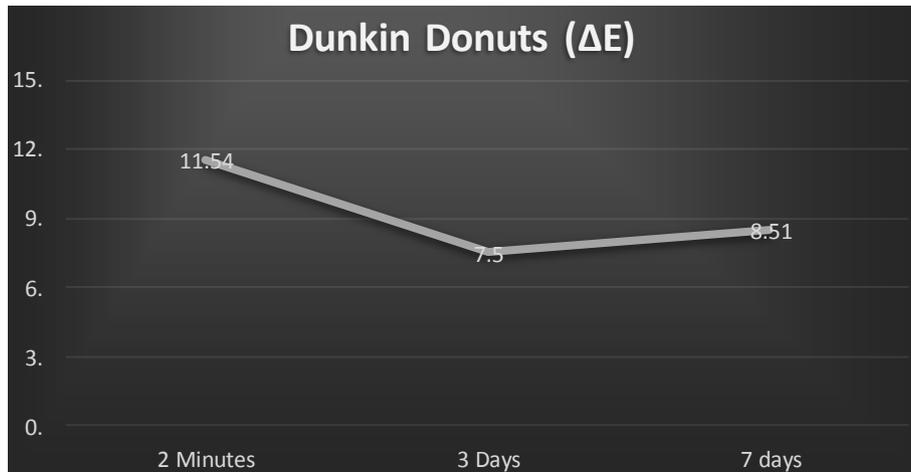


Figure 3. Mean values of color change (ΔE) of Dunkin Donuts coffee brand at different periods of time

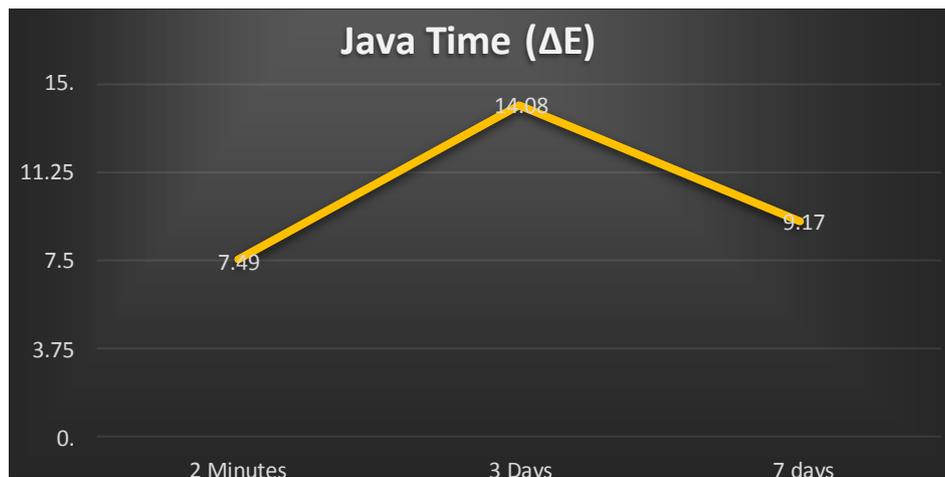


Figure 4. Mean values of color change (ΔE) of Java Time coffee brand at different periods of time

concentration of the caffeine in each coffee brands. These findings are in consistence with a recent studies which evaluated the staining effect of similar brands of coffee available in the Saudi market on the composite restorations 9-10.

Adsorption and absorption can be the cause of coffee discoloration. Coffee includes yellow color causing materials that have low polarity which are released with delay and penetrate to the organic part of the

tooth. Time has been a dominating factor in a further color change in the coffee-soaked samples, as shown by different values of ΔE found over time. This finding is in confirmation with a previous study which reported staining solution and time factor had a significant effect on color change 11. Further studies with longer period of aging would confirm the finding of this study.

CONCLUSION

Within the limitation of this study, it can be concluded that all coffee brands used in this study caused teeth

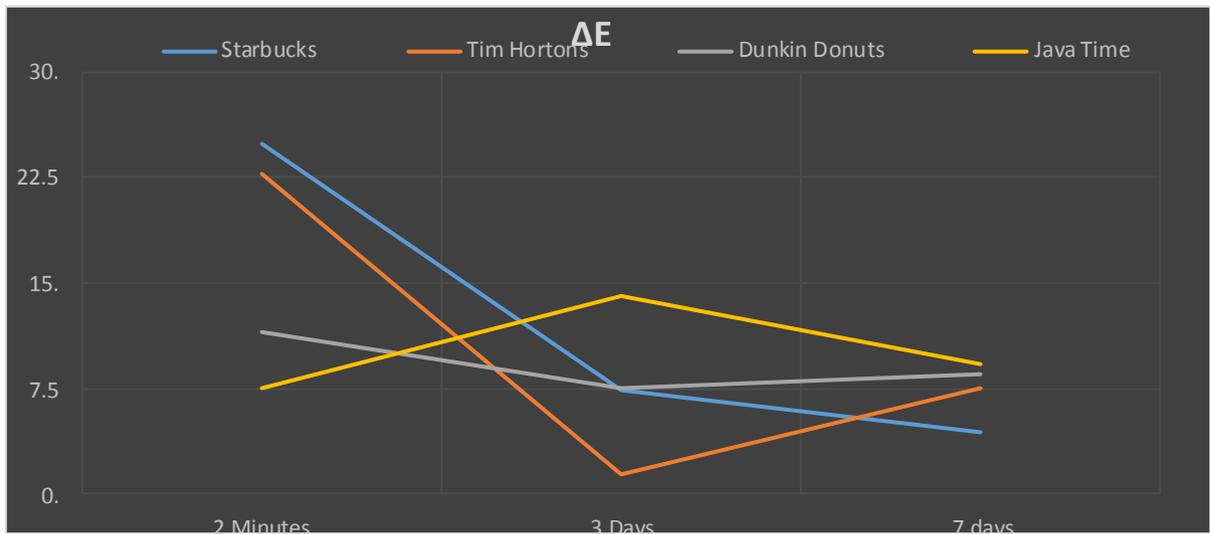


Figure 5. Mean values of color change (ΔE) of all four coffee brands at different periods of time

discoloration. The effect of the coffee brands on the color change of the teeth depends on type, amount, and concentration of each brand. Nevertheless, staining in

the oral cavity may require a longer period of time due to the intermittent nature of coffee exposure. Moreover, saliva and other fluids will dilute staining solutions and teeth will also be polished by tooth brushing.

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