

**In Vitro Evaluation of the Remineralization  
Effect of Two Types of Natural Agents on  
Artificial Enamel Caries Lesions**

*Thesis submitted to*

***Faculty of Dentistry - Ain Shams University***

*In partial fulfillment of the requirements for the master's  
degree in Pediatric Dentistry*

By

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2017

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## *Acknowledgement*

I would like to express my deep gratitude to **Dr. Nadia Ezz Eldein Metwalli**, Professor, Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Ain Shams University for her professional guidance and valuable support. It was an honor to work under her supervision.

I am particularly beholden for the assistance given by **Dr. Amira Saad Badran**, Lecturer, Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Ain Shams University, for her constructive suggestions and her patience during the development of this research. Her meticulous reading and her willingness to give her time so generously are much appreciated.

I also wish to thank **Dr. Khalid Hadad**, Lecturer, Oral Biology Faculty of Dentistry, Ain Shams University, for his explaining about the scanning electron microscope so diligently, and **Dr. Yasmine El Qabany** for her effort in the microhardness testing at the National Institute of Research. She showed up a lot of care and help throughout this research. Special thanks to the staff members of Scanning Electron Microscope at The Egyptian Mineral Resources Authority Central Laboratories Sector for their valuable technical support.

I would like to express my deepest thanks to my dear professors, colleagues and staff members of Pediatric Dentistry, Dental Public Health Department, Faculty of Dentistry, Ain Shams University for their great help and support.

## *Dedication*

**To the soul of my Mother**

**She always empowered me by her trust in God,  
patience and insistence. I just hope I have made you  
proud.**

My Father I couldn't achieve anything in my life without your  
guidance and love.

My Sister, my life partner no word could be enough to thank  
you.

Finally my soul mate Manar Galal, thank you for being in my  
life.

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## List of Abbreviations

Word	Abbreviation
Atomic force microscopy	AFM
Calcium	Ca
Calcium fluoride	CaF <sub>2</sub>
Carbon	C
Carboxylate ion	COO <sup>−</sup>
Casein phosphopeptides	CCP
Casein phosphopeptides- amorphous calcium phosphate	CCP-ACP
Casein phosphopeptides – amorphous calcium fluoride phosphate	CPP-ACFP
Citric acid solutions	CAS
Deionized water	DDW
Enamel surface microhardness	ESMH
Grape seed extract	GSE
Grape seed proanthocyanidins extract	GSPE
Gram	gm
Gum Arabic	GA
Highly esterified pectin	HP
Hydrogen ion	H <sup>+</sup>

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<b>Hydroxyapatite</b>	<b>HAP</b>
<b>Initial enamel caries lesions</b>	<b>IECL</b>
<b>Microhardness</b>	<b>MH</b>
<b>Microliter</b>	<b>μL</b>
<b>Milliliter</b>	<b>ML</b>
<b>Mole</b>	<b>M</b>
<b>Millimole</b>	<b>mM</b>
<b>Minimum intervention dentistry</b>	<b>MID</b>
<b>Phosphorus</b>	<b>P</b>
<b>Proanthocyanidins</b>	<b>PAs</b>
<b>Propylene glycol alginate</b>	<b>PGA</b>
<b>Scanning electron microscope- Energy Dispersive X-ray Analyses</b>	<b>SEM-EDX</b>
<b>Sodium fluoride</b>	<b>NaF</b>
<b>The American food and drug administration</b>	<b>FDA</b>
<b>The American National Institutes of Health</b>	<b>NIH</b>
<b>Vickers hardness number</b>	<b>VHN</b>