

**EFFECTS OF CARBOXYMETHYL CELLULOSE AND CHITOSAN
ON THE STABILITY OF ICE CREAM UPON FREEZE-THAW
CYCLES**

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**Final Year Project Proposal Submitted in
Partial Fulfillment of the Requirements for the
Bachelor of Science (Hons.) Food Science & Technology
Faculty of Applied Sciences
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JUNE 2013

AKNOWLEDGEMENTS

I am most grateful to ALLAH s.w.t, the Most Merciful, the Most Gracious and the Most Beneficent.

First of all, syukur Alhamdulillah to Allah the Almighty for His consent for making successful completion of this final year project and because of Him, I have strength in everything I do. Upon completion of this project, I would like to express my gratitude to many parties. My heartfelt thanks goes to my supervisor and advisor, Dr Aishah binti Bujang for her guidance, effort that she gave to me and valuable comments throughout the study. Honestly, without her guidance I wont be able to complete my project in time. Special thanks to my lovely mother and family for their support, encouragement and perseverance. I would also record sincere gratitude and appreciation to all Food Technology lecturers, whose encouragement and optimism have given me the urge and strength to complete this project. I also would like to dedicate my appreciation to dedicated lab assistants of all Food Sciences and Technology and to my friend who always support me and help me throughout this project. Not to forget, for Perpustakaan Tun Abdul Razak and all the staff who help me to explore more knowledge with comfort facility. Thanks are also due to numerous people who contributed directly or indirectly in making this project successful.

Maisarah Shamsudin

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ABSTRACT

THE EFFECT OF CARBOXYMETHYL CELLULOSE AND CHITOSAN ON THE QUALITY OF ICE CREAM UPON FREEZE-THAW CYCLES

Ice cream is a mixture of two immiscible liquids of water and fat, therefore the emulsifier used in preparation of ice cream is very important. This study was conducted to determine the emulsifying effect of carboxymethyl cellulose (CMC) and chitosan in ice cream production upon freeze thaw cycles. Four formulations were developed which are addition of 0.6% commercial emulsifiers smoothex as control, 0.6% chitosan, 0.6% CMC and combination of 0.3% CMC and 0.3% chitosan. The ice cream quality was evaluated in term of viscosity, creaming index, overrun, meltdown, pH value and rheological properties of storage and loss modulus. On overall, results shows that substitution of CMC and chitosan had significant effect toward the quality of ice cream upon freeze thaw cycles. On freshly made ice cream, addition of different emulsifier affects viscosity, pH value, overrun, meltdown, storage modulus and loss modulus but did not affect the creaming index. However, when subjected to freeze thaw cycles, the quality of ice cream was found to be affected by the type of emulsifiers used. Overrun, meltdown and storage modulus showed increasing trend with the increasing number of freeze thaw cycles. Viscosity, creaming index and rheological properties of loss modulus showed decreasing trend with the increasing number of freeze thaw cycles. Only pH value was found not affected by the freeze thaw cycles. Based on the result obtained, the best emulsifier is CMC because it gives the highest viscosity and the most stable creaming value throughout the freeze thaw cycles.

CHAPTER 1

INTRODUCTION

1.1 Background of study

The ice cream production, one of the main desirable attributes that appeal to the consumer is the texture of ice cream. One of the factors that contribute to the changes of the texture of ice cream was size of ice crystal formed. The small ice crystal formed gave the smooth pleasant texture of the ice cream while the large ice crystals formed in nucleation process contribute to gritty and hard texture. The ice cream exposure to fluctuating temperature causes the ice crystal to recrystallised, thus causing the disappearance of the small crystal and the formation of large ice crystal which harden the ice cream texture. The addition of the stabilisers or emulsifiers in the ice cream mixture helped to minimised the growth of large ice crystal.

Ice cream is a mixture of two immiscible liquids of water and fat in which the milk fat dispersed as small spherical droplet in the water. Thus make ice cream oil in water emulsion. Emulsifier is a substance that was normally used to mix the two immiscible solutions. The emulsifier is surface-active molecules that absorb the emulsion droplet to form a protective coating prevent form aggregating from one to another. Kinetically, the emulsion was unstable due certain period of time because of the water molecule contact to oil is energetically unfavourable (Murano, 2003). In the ice cream manufacturing, the addition of stabiliser and/or emulsifier in the product formulation mixture was needed to get desirable quality of the ice cream in terms of taste, texture, shelf life and nutritional value. Stabiliser or/and