EFFECTS OF STABILIZERS ON FAT AGGLOMERATION AND MELTING RESISTANCE IN ICE CREAM

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ABSTRACT

Fat network is known as one essential element in development of ice cream infrastructure. The main goal in the study was to understand the effect of stabilizers on fat agglomeration during freezing in the presence and absence of emulsifier. Eight commercial ice cream samples were analyzed for particle size and melting properties. Additionally, ice cream was mixed to contain 10% milk fat, 10% milk solids-not-fat, 12% sucrose, 6% corn syrup solids, and 0.15% carboxymethyl cellulose (CMC). The formulations also included mixes with and without 0.15% mono-and-diglycerides (MDG). Fat agglomeration was indicated by D[4.3] and % particles above 10 μm as measured by a Malvern Mastersizer. Melting rate was defined as amount of dripping loss divided by melting time. Commercial ice cream analysis showed that ice cream with egg yolks (EY) and no stabilizers had no fat aggregates. Particle size distributions varied between ice cream brands. Ice creams with MDG or those with gums in addition to EY showed an increased aggregation. Ice cream without stabilizer had no fat aggregates and melted at the fastest rate. Gums decreased the melting rate and the melting properties were independent from particle size. Ice cream with only CMC showed the highest amount of fat aggregates and highest melting resistance. The effect was followed by ice cream made with both CMC and MDG, and only MDG. The amount of fat aggregates was highly correlated to the melting resistance of the ice creams. Ice cream with most melting resistance had greater amount of fat aggregates.

INTRODUCTION

Ice cream is a complex food colloidal that consists of fat globules, air bubbles, air crystals and an frozen serum phase. The fat globules are coated with protein-emulsifier layer. During freezing this fat molecules form a network of fat agglomerate (Goff, 1997). Up to certain amount, fat agglomeration contributes to smoother and better mouthfeel ice cream. Emulsifier is known to promote fat destabilization during freezing of ice cream and thus enhance texture. However, no information is available about contribution of stabilizers in fat destabilization. Stabilizers or gums are commonly used in ice cream to improve mouth feel by influencing water mobility, but their effect on fat agglomeration during freezing is unknown. Fat agglomeration can be used to predict ice cream stability and quality.

OBJECTIVES

To investigate the effect of stabilizers used in commercial ice cream to fat agglomeration and to study the effect of CMC as stabilizer on fat agglomeration during freezing in the presence and absence of emulsifier.

MATERIALS AND METHODS

Eight commercial ice creams were purchased from local supermarket. Four different ice cream mixes were made at OSU pilot plant. All of the dry ingredients were dry blended and mixed with the liquid portion at 48°C for 10 minutes. Mixes were pasteurized at 70°C, 30 min, homogenized at 2000/500 psi (two stage homogenizer) and aged overnight at 4°C.

Ice cream mixes were frozen in a batch freezer (Coldelite LB252) – 1.25 gallon of mix per batch. Draw temperature and overrun were obtained. Fresh mixes, aged mixes and ice cream were analyzed for particle size distribution and melting rate.

Analysis

Particle size distribution was obtained by integrated light scattering using Malvern Mastersizer. Ice cream made in OSU pilot plant were analyzed using a Mettler Toledo DSC. All samples were analyzed at a rate of 10°C/minute with 5°C/melting.

Mix and Ice cream preparation

Commercial ice creams

There were differences of fat globule distribution and melting rate among different brands of ice cream. Sample A, with the lowest D[4.3] value had no fat aggregates and melted at the fastest rate. Ice cream with MDG as emulsifier had more fat agglomeration compare to ice cream with EY as emulsifier (Table 2). The melting rate were independent of fat aggregates.

Ice cream made in OSU pilot plant

Ice cream with stabilizers had higher amount of fat aggregates.

REFERENCES


