COMPARATIVE ANALYSIS OF ICE CREAM MIX PROCESSING WITH AND WITHOUT ADDITION OF EMULSIFIERS

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REZUMAT.Studiul îşi propune să analizeze două mixuri de înghețată cu și fără stabilizatori şi emulgatori, în ceea ce privește analiza senzorială şi fizico-chimică.În urma analizei s-a constatat că emulsificatorii şi stabilizatorii joacă un rol critic pentru a obține mixul de înghețată:stabilizatorii sunt folosiți în fabricarea tipurilor de înghețată în timpul procesului inițial, influentând omogenitatea și vâscozitatea mixului. Emulgatorii reduc tensiunea la interfaţa apă / grăsime, ceea ce favorizează emulsificarea, formată între grăsime/apă/emulgator, care stabilizează emulsia la interfaţa.

Cuvinte cheie: mix-ul de inghetata,stabilizatori,emulgatori

ABSTRACT. This study aims to analyze two ice cream mixes with and without stabilizers and emulsifiers in terms of sensory and physico-chemical analysis. Following the analysis performed we found that emulsifiers and stabilizers play a critical role to obtain ice cream mix: stabilizers work in the manufacture of ice cream mix during the initial processing, influencing homogeneity and viscosity of the mix. Emulsifiers reduce tension at the interface water/fat, which favors emulsification, formed between fat / water / emulsifier which stabilizes the emulsion at the interface.

Keywords: ice cream mix, stabilizers, emulsifiers

1. INTRODUCTION

Ice cream is a colloidal and complex system, whose characteristics are given of milk and derivate products, as well as other ingredients added.

In terms of technology, ice cream can be defined as a frozen product obtained by freezing in special conditions of a homogeneous mixture, pasteurized consisting of: milk, cream, sugar, various ingredients, stabilizers, food colouring, emulsifiers and flavours. It has become a consumer food because of its taste qualities, with a high nutritional value: 100 g ice cream with 12% fat provides about 200 calories (1 kg ice cream can replace, from the energetically point of view, 434g bread, 738g beef, 851g eggs) [3,7]. Nutritional value of ice cream is due to rich carbohydrates, protein substances, fats, vitamins (Vitamin A and the B complex) and minerals (Ca and P).

Ice cream and similar products are essential sources in a normal diet, contains nutritional ingredients, which normally are not found in other frozen desserts [2]. Can be easily coloured and flavoured to suit any added nutrient and structure contains both specific inclusions (private) and semi-solid inclusions [1,4].

This study aims to analyze two ice cream mixes with and without stabilizers and emulsifiers in terms of sensory and physical-chemical examination.

2. MATERIALS AND METHODS

To obtain the mix with stabilizers and emulsifiers were made the following steps: pour water and rise temperature to a minimum 65˚C; add milk powder and some sugar (2/3) then dissolve; add remaining sugar mixed with stabilizer and mix until completely dissolved; add melted coconut oil in advance, the temperature raised to 80-82˚C (about 30 seconds) and cooled to 10˚C, add flavour and mix it strong. The homogenization of the mix is achieved by vigorous and continuous shaking, in hunt for pasteurization [5,6].

The mode to make ice cream mix without stabilizers and emulsifiers is similar, except that these additives are not added to the mix composition.

2.1 Sensory analysis

Were determined sensory characteristics (appearance, colour, taste and smell) of ice cream mix with and without stabilizers and emulsifiers?

2.2 Physico-chemical analysis

Determining the degree of homogenization: Examine at the microscope a drop of the mixture, diluted in advance, using 90x immersion lens (magnification = 900).

Determination of dry matter: The oven drying method.

Determination of acidity: Acidity of a given volume of sample prepared for analysis is neutralized by titration with sodium hydroxide solution 0.1 N in the presence of phenolphthalein as an indicator.

Determination of pH: The direct method using the pH meter.

Determination of viscosity: Viscosity is determined with Haake VT 7 plus viscose-meter, which is used for rapid viscosity determinations according ISO 2550 and many ASTM standards. Viscose-meter works the same way as all viscose-meters based on rotation and has a viscosity range between 20 and 40 000 000 mpas (21 speeds with 6 axes) for testing the viscosity of the fluid from medium to the highest.

3. RESULTS AND DISCUSSION

3.1 Sensory analysis of the two ice cream mixes

Sensory analysis of ice cream mix with stabilizers and emulsifiers

Fig.1. *Ice cream mix with stabilizers and emulsifiers*

Table 1. *Sensory characteristics of ice cream mix with stabilizers and emulsifiers*

Sensory characteristics	
Appearance	- viscous liquid, homogeneous throughout the mass without fat or stabilizing clusters
Colour	- uniform, pleasant, characteristic
Taste	- pleasant, filler used properly, no foreign smells
Smell	- pleasant, characteristic

Sensory analysis of ice cream mix without stabilizers and emulsifiers

Fig.2. *Ice cream mix without stabilizers and emulsifiers*

Table 2. *Sensory characteristics of ice cream mix without stabilizers and emulsifiers*

Sensory characteristics	
Appearance	- heterogeneous liquid with clusters of fat
Colour	- uneven
Taste	- pleasant, filler used properly
Smell	- pleasant, characteristic

3.2 Physico-chemical analysis of the two ice cream mixes

Determining the degree of homogenization observed under a microscope with 90x immersion objective (magnification = 900).

a) Ice cream mix with stabilizers and emulsifiers

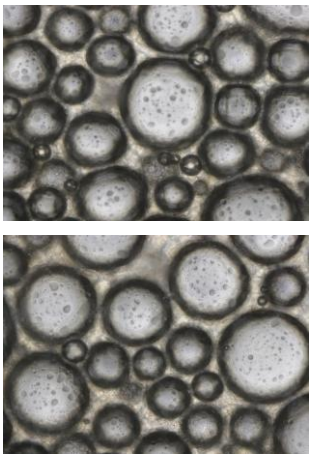

Fig.3. *The degree of homogenization, the mix with stabilizers and emulsifiers*

b) Ice cream mix without stabilizers and emulsifiers

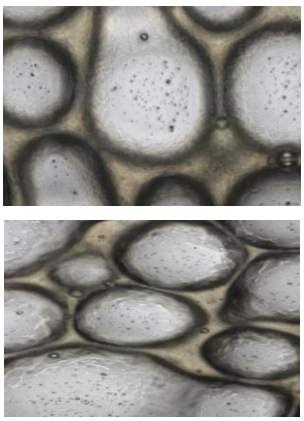

Fig.4. *The degree of homogenization, the mix without stabilizers and emulsifiers*

Determination of dry matter

Determination of dry matter for the two ice cream mixes was done using the oven at a temperature of 102 ± 2˚C for 2 h, and the results of two successive measurements are:

- 28.76% dry matter, for ice cream mix without stabilizers and emulsifiers;
- 32, 59% dry matter, for ice cream mix with stabilizers and emulsifiers.

Determination of acidity

In determining the acidity, were used 5 g ice cream mix, 80 ml distilled water 2-3 drops of phenolphthalein and sodium hydroxide solution for titration to the emergence of a pink colour.
The results are:

- mix with stabilizers and emulsifiers acidity is 20˚T;
- mix without stabilizers and emulsifiers acidity is 24˚T.
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Determination of pH

PH determination was made with Mettler Toledo pH meter on the first day and fourth day at a storage temperature of 0-4˚ C. The results for each type of mix, in the two days are represented in the figure below.

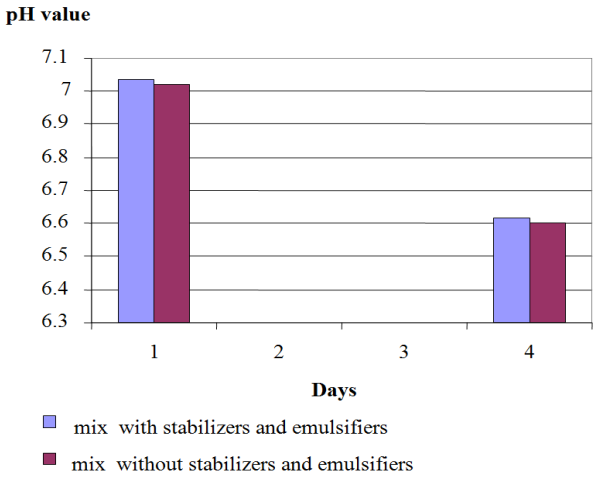

Fig.5. *Determination of pH in the first and fourth day*

Determination of viscosity

Viscosity of the two mixes was determined on the first and fourth day of their manufacture, with viscose-meter. Viscosity on the first day was made using spindel R2, at 100 rpm and the results are:

- the ice cream mix, with stabilizers and emulsifiers, viscosity is 200 mpas;
- the ice cream mix, without stabilizers and emulsifiers, viscosity is 27 mpas.

On the fourth day viscosity was made also using spindel R2, at 100 rpm, and the results are:

- the ice cream mix, with stabilizers and emulsifiers, viscosity is 1341 mpas;
- the ice cream mix, without stabilizers and emulsifiers, viscosity is 74 mpas.

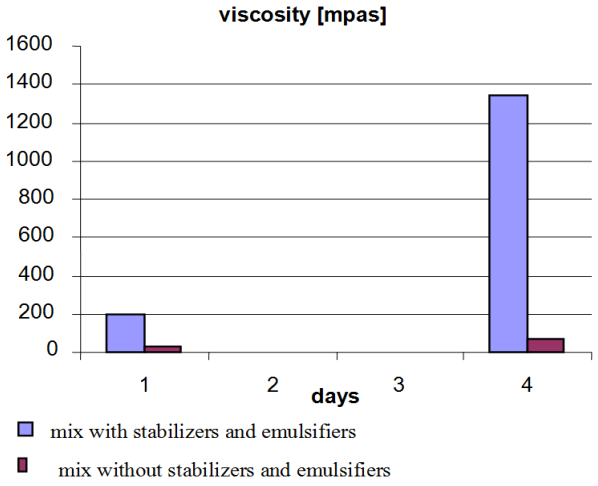

Fig. 6. *The viscosity of the two mixes*

Following analyzes have found that emulsifiers and stabilizers plays a critical role in getting ice cream mix. According to the Order 438/2002, emulsifiers are substances which make it possible to form and maintain emulsions W/O and O/W (water in oil and oil in water), and stabilizers are substances that make it possible to maintain the physico-chemical state of a foodstuff. Stabilizers include substances that are able to maintain a homogenous dispersion consisting of two or more immiscible liquid in a foodstuff.

Because emulsifiers are able to reduce tension at the interface water/fat, which promotes emulsification pictures and formed a balance between fat/water/emulsifier, and stabilizers, prevent separation and uneven distribution of mixture components, providing an appropriate form mixture, avoiding congestion. In case of ice cream mix without stabilizers and emulsifiers resulted in separation of fat from mix, which can be seen in the below.

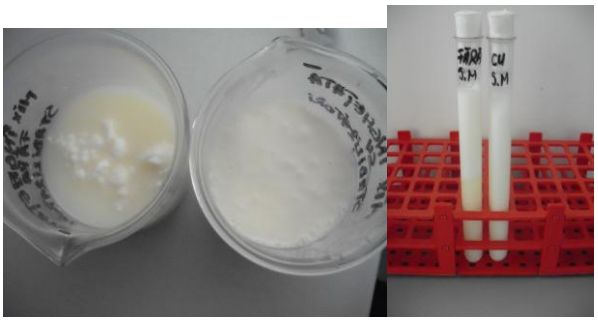

Fig.7. *Ice cream mix without stabilizers and emulsifiers compared with the ice cream mix with stabilizers and emulsifiers*

During stabilization mix (until homogenization) emulsifier practically doesn`t occurs, natural phospholipids and proteins from milk are sufficient to maintain stability of fat globules in the mix

existent. At homogenization of the mix, when form big fat globules are formed more smaller fat globules, which means a larger total area is needed the presence of emulsifier to form a protective film around small fat globules.

The presence of emulsifiers and stabilizers in ice cream mix leads to change of its viscosity, so the presence of these additives produces a mix more viscous, homogeneous, and smooth without clumps of fat.

Also the pH and acidity are influenced by their presence in ice cream mix so the mix without stabilizers and emulsifiers has a more acidic pH and higher acidity compared to the mixing which was used emulsifiers and stabilizers.

Concentration in the dry matter of mix suffers changes, so if in the mix were added stabilizers and emulsifiers, dry matter content is higher than the dry matter content of ice cream mix without stabilizers and emulsifiers.

4. CONCLUSIONS

Stabilizers work in the manufacture of ice cream during the initial processing mix, influencing homogeneity and viscosity of mix.

Emulsifiers are designed to reduce tension at the interface water/fat favouring emulsification formed between fat/water/emulsifier which stabilize the emulsion.

The role of stabilizers and emulsifiers to achieve the ice cream mix is very important because they give to the final product mix a smooth consistency, provide uniform distribution of product components and maintained microcrystalline microstructure of the finished product. Also, provides a longer life tremens, protecting food from microbiological deterioration.

The use of additives is needed because the food gets a nice colour, soft consistency, they become more attractive, to please consumers.

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