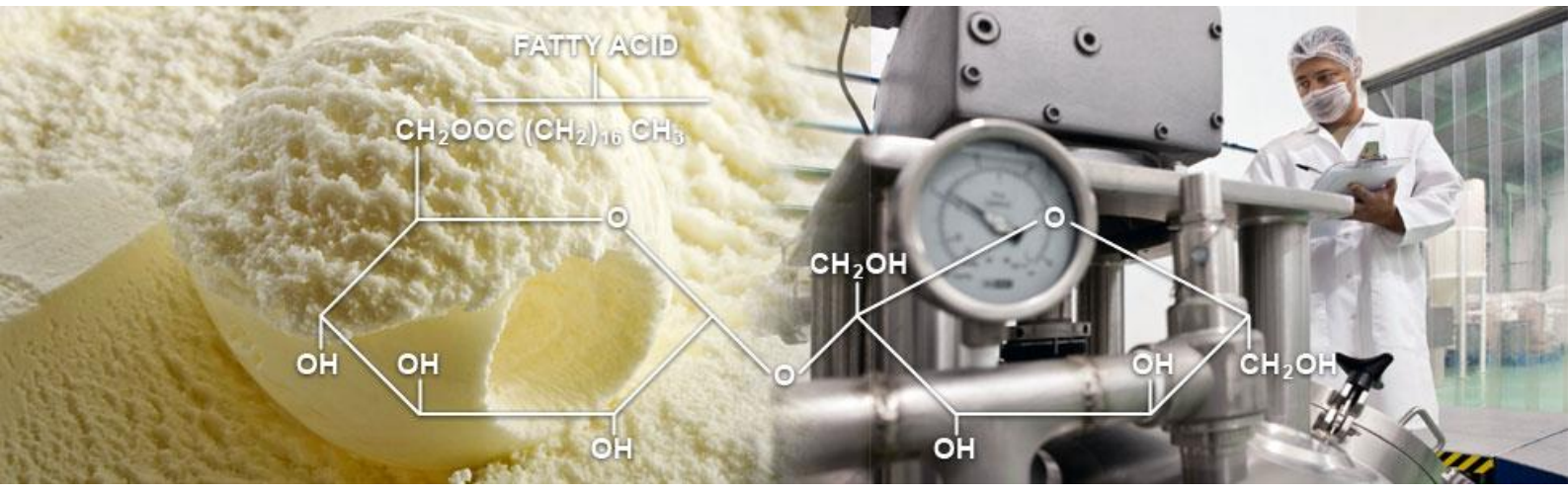
SISTERNA®

For know-how in sucrose ester techniques

SUCROSE ESTERS
IN ICE CREAM & VEGAN ICE



ICE CREAM

The requirements for ice cream or ice milk are very diverse. Consumers require certain eating characteristics or a specific flavour profile. The producer requires quick and easy production. Quality assurance requires a product that can withstand temperature fluctuations. All these requirements are related to the choice of emulsifier, and so a combination of emulsifiers is often used. Emulsifiers improve the distribution of the fat globules and, during aeration/freezing, the destabilisation and agglomeration of fat globules. Furthermore, emulsifiers affect the amount of air incorporated and reduce shrinkage during storage. A finished ice cream depends on the right choice of emulsifiers for its texture, dryness and melting properties.

Sisterna sucrose esters in ice cream

- Excellent clean eating properties
- Improved flavour release
- Reduction of ageing time
- High overrun at low dosages
- Reduction of aeration time
- Homogeneous melting properties
- Cold processing possible in ice cream powder

AGEING TIME

Sucrose esters reduce ageing time effectively as they can quickly replace the proteins from the fat globules (where cream is used as the fat source). Sucrose ester molecules are smaller than proteins and have stronger surface activity. Reduction of ageing time can save hours in the production process.

OVERRUN

Sucrose esters as powerful aerating agents ensure a quick overrun and a stable product. Sucrose esters decrease the surface tension between air and water, facilitating aeration.

CLEAN EATING PROFILE

High HLB-value sucrose esters have very strong surface activity, ensuring smaller fat globules upon homogenisation of the ice mix and smaller air bubbles upon freezing. It is generally known that smaller fat and air globules result in a smoother, creamier mouth feel. Ice cream with sucrose esters is perceived by the consumer as fresh, creamy, milky and soft, while low-HLB emulsifiers are perceived as more churned and greasy.

READY-TO-USE ICE CREAM POWDER

Because of its water solubility, sucrose esters are excellent emulsifiers for use in ice cream powder. But this property can also be used in ready-to-eat ice cream. When using sucrose esters, it is possible to skip the pasteurisation and homogenisation step and to prepare the ready to-use ice cream directly after dissolving it into the water (cold emulsification).

ADVICE

Sisterna PS750 and Sisterna SP70 are used as emulsifier in ice creams with varying fat content. The dosage is 0.2-0.3% over the total mix. Both grades are suitable for pasteurisation, but Sisterna PS750 works better for cold processing. Sucrose esters combine well with mono- and diglycerides (E471) to give the right balance in terms of stability and flavour profile.

SENSORIAL TEST

In order to prove the effect of sucrose esters on the flavour release of ice cream, a sensorial test was performed. A comparison was made between ice cream based on partly unsaturated mono- and diglycerides 90% (uDMG) and ice cream based on Sisterna SP70.

CONCLUSION

The flavour perception, eating quality and heat-shock stability of (natural) vanilla ice cream was improved by using SP70 as emulsifier. The vanilla flavour, the creamy/buttery sensation, and the phenolic attributes were stronger. The vanilla flavour remained strong even after heat shock. Where the ice cream with uDMG became hard after heat shock, the SP70 sample kept a soft bite. The flip side of this softness is that the ice cream also melted quicker. A combination of Sisterna SP70 and uDMG can create ice cream with the benefits of both emulsifiers. A blend of both proved to be successful in various commercial ice creams.

FLAVOUR PROFILE

Churned fat or so-called “free fat” is needed to create a stable ice cream. Too much churned fat covers the tongue’s palate, reducing perception of flavour. More flavours have to be added and even then it is not always possible to taste the total flavour profile. Especially when using delicate expensive flavours, it is worthwhile balancing the free fat with the help of sucrose esters. Sucrose esters create smaller, more stable fat globules compared to traditional emulsifiers. Ice cream produced with sucrose esters will have less free fat and a pure flavour profile.

Ingredients	%
Sucrose	15
Fat powder	10
Skimmed milk powder	10
Emulsifier	0.3
Guar gum	0.1
Locust bean gum	0.1
Vanilla flavour	q.s.
Water up to	100

Preparation

- Blend the powder ingredients
- Add the blend to the water phase and mix
- Pasteurise (85˚C) and homogenise (130 bar) the mix (not strictly necessary)
- Cool the ice mix to <4˚C and mature for 20 min.
- Freeze and aerate the ice mix to 100% overrun
- Store at -40˚C

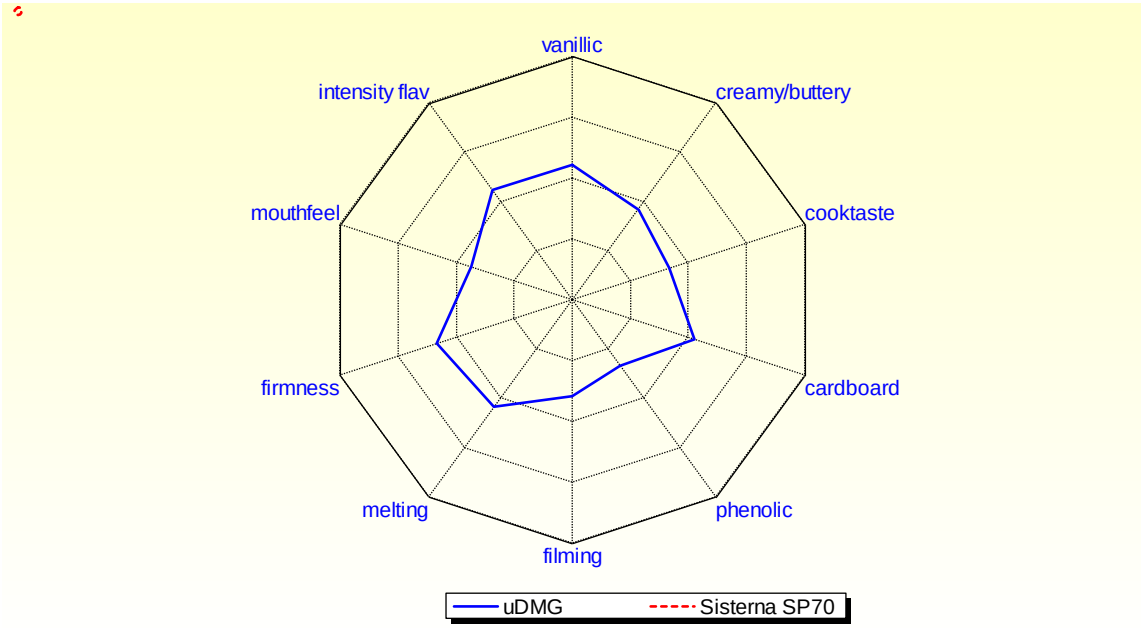
Attributes were generated according to “Quantitative Descriptive Analysis” by 10 trained panellists. A result on the outside of the spider plot means a more intense flavour, more filming (fat film in the mouth), quicker melting, harder bite and warmer mouth feel.

All sensory tests were performed at -10°C and four times, of which the first two times were considered as training for the panel. A set of samples was heat shocked (HS) and then cycled over -10°C and -20°C every 12 hours for two weeks. These samples were tested separately.

RESULTS

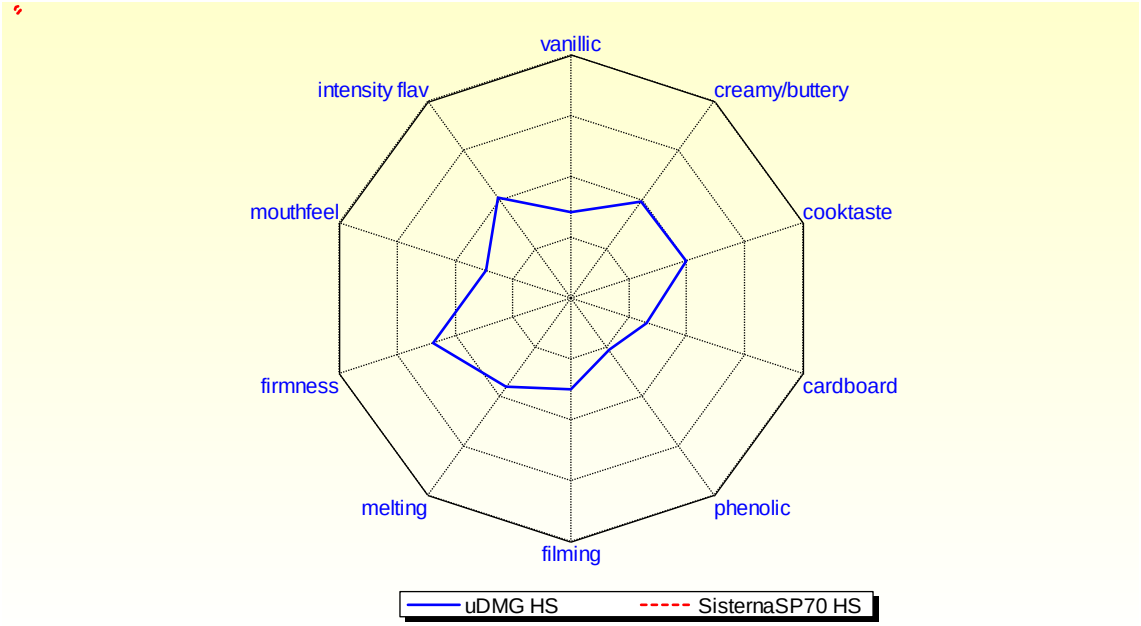
Spider plot before Heat Shock

Ice cream before heat shock: uDMG (blue line) and Sisterna SP70 (red dotted line).



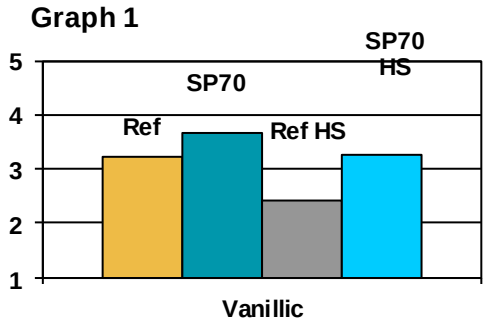
Spider plot after Heat Shock

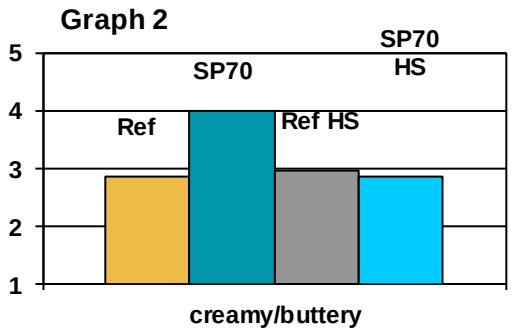
Ice cream after heat shock: uDMG (blue line) and Sisterna SP70 (red dotted line).



MOST IMPORTANT DIFFERENCES

1. The vanilla flavour of the ref. (with uDMG) samples was weak and further reduced by heat shock (graph 1). The good vanilla flavour of SP70 was far less affected by heat shock (HS).
2. The creamy/buttery flavour of the ref. sample was weak but not much affected by heat shock (graph 2). The good creamy/buttery flavour of SP70 decreased to the same level as the ref. by heat shock.
3. The better phenolic flavour with SP70 was reduced to the same low level as the ref. by heat shock.
4. Initially there was no difference in melting behaviour, but after heat shock the SP70 samples melted quicker than the ref.
5. Initially there was no difference in firmness. However, after heat shock the SP70 samples retained a softer bite whilst the ref. became hard.





VEGAN ICE

Veganism is becoming increasingly fashionable and vegan food is seen as something in which indulgence, health and/or animal welfare meet. Sisterna developed a vegan ice recipe and found the same benefits from using sucrose esters as were described in this technical note for milk containing ice cream. The preparation of this vegan ice is also comparable with that of dairy ice cream.

Ingredients	% w/w
Sucrose	15
Dried glucose syrup[1]	4
Dextrose[2]	1.5
Coconut fat[3]	10
Soy protein[4]	4
Sisterna SP70	**0.5**
Locust bean gum	0.1
Guar gum	0.1
Vanilla flavour	q.s.
Water up to	100%

[1] C*Dry 01924, Cargill
[2] C*Dex 02043, Cargill
[3] Kristal, AAK
[4] ADM PRO FAM 974