facts

Pure chocolate with ERYLITE® Erythritol

Jungbunzlauer

From nature to ingredients®

Introduction

The Aztecs, a thousand years ago, already knew the high enjoyment value of the fermented cocoa fruit and made a drink of cocoa, water, vanilla and cayenne pepper that they called chocolate. At that time it was a more healthy drink without sugar and was known as the food of the gods.

Cocoa found its way to Europe and industrial production started in the beginning of the 19th century, when cocoa was blended with sugar in a roller mill. The result was a fine chocolate with a pleasant mouthfeel, affordable by everyone. Today, annual per capita consumption of chocolate in central Europe is almost 8 kg. The Swiss have the highest consumption, at 8.8 kg per year. Chocolate products overall now account for more than 50% of the global confectionery market share (Innova, 2017).

Reducing sugar in our diet is one of the most dominant topics in the public health debate. Chocolate has always been a popular confectionery item but unfortunately it has a high sugar and fat content (up to 45%). The basic recipe has changed very little but nowadays there is also reduced-sugar chocolate and chocolate with no added sugar on the market.

Today many consumers practise a healthier lifestyle focusing on healthy food and a reduction in sugar, fat and salt. They also follow new trends such as vegetarianism and veganism. This has resulted in the development of new products boasting all manner of “free from…” or “reduced…” claims, with associated changes in taste and texture. But the bottom line is that consumers rarely accept a compromise in taste and quality. Product developers must come up with innovations that result in equivalent products with the same pleasant taste and mouthfeel.

Sugar reduction can be achieved in different ways: total sugar exchange, partial sugar exchange or stepwise sugar exchange over a period of time. Chocolate with no added sugar is readily available on the market. However, it rarely compares favourably with normal chocolate in terms of taste and texture. The taste profile often lacks the typical sugary sweetness and the texture is affected by the changes in processing parameters required for a sugar-free chocolate mass. Therefore, high-quality sugar-free chocolate depends on a sugar replacement that fulfils both the sweetening quality as well as the functionality of sugar. ERYLITE® Erythritol largely meets these requirements.

ERYLITE® Erythritol - made naturally by bio-fermentation

Erythritol is a naturally-occurring sugar alcohol (polyol) that is manufactured from glucose using a natural fermentation process. It is a great alternative to other polyols and bulk sweeteners due to its unique attributes: it is noncaloric, it has a high digestive tolerance of around 0.8 g/kg bodyweight and a low hygroscopicity. Unlike other polyols, erythritol is naturally present in many foods such as wine, soy sauce and a variety of fruits.

Properties of ERYLITE® Erythritol

ERYLITE® is approximately 60% as sweet as sugar although this varies by application. It is therefore recommended that ERYLITE® can be blended with high intensity sweeteners in order to increase the sweetness. This kind of blend usually has a higher perceived sweetness than theoretically calculated and this synergy allows a reduction in high intensity sweeteners and in actual costs. The blend has zero calories and offers a clean sweetness very similar to that of sugar. This is particularly important for chocolate where sweetness is the dominant taste sensation beside the flavour of cocoa.

ERYLITE® helps to mask the presence of steviol glycosides in chocolate. Stevia plant extracts always impart a characteristic taste profile even at highest purity levels. That taste profile is characterised by liquorice and a lingering effect that is hard to ignore. Although steviol glycosides have improved in flavour over recent years, ERYLITE® significantly mitigates the remaining unpleasant notes and eliminates the lingering effect.

Cooling sensation
ERYLITE®'s high negative heat of solution may result in a cooling sensation during consumption of chocolate. 180 J/g energy is needed to dissolve erythritol crystals in water and this cools down the food matrix. Depending on the desired product properties, this effect of erythritol-based products may be advantageous in generating a fresh mouth feel, e.g. in mint-flavoured chocolate products. Should the cooling sensation not be required, it can be counteracted by blending ERYLITE® with ingredients that have a positive heat of solution such as polydextrose or inulin or with some sugar alcohols with a more neutral heat of solution such as isomalt and maltitol.

ERYLITE® Erythritol - first choice for sugar replacement in chocolate

In traditional chocolate recipes, the calories contributed by sucrose account for one-third of the overall caloric value. ERYLITE® has a calorie content of 0 kcal/g and thus a calorie reduction of 30% is possible. This is a big advantage over other polyols, which deliver a calorie contribution of 2.4 kcal/g.

- The flavour of ERYLITE® has similar attributes to sucrose and, in combination with intense sweeteners, it significantly improves the sweet taste profile, particularly in products based on steviol glycosides.

- The end product is suitable for low-sugar diets since ERYLITE®'s glycaemic index is zero and it does not raise plasma glucose or insulin levels. This claim is approved by the EFSA (European Food and Safety Authority). The second claim approved by EFSA is tooth-friendliness since ERYLITE® does not decrease the pH level in the mouth after consumption and is, therefore, non-cariogenic.

- Erythritol chocolate is non-hygroscopic, has an excellent gloss, good breaking or snap characteristics and pleasant melting properties in the mouth. No major changes in the production process are required.

Chocolate production with ERYLITE® Erythritol

Traditional chocolate production is a four step process of mixing or refining, conching, tempering and moulding (Lebensmitteltechnik, 1996).

Grinding and the importance of particle size

The sucrose and granular ingredients are ground and mixed with the cocoa liquor mass in a multiple roller mill to obtain a smooth paste. The ingredients may be added stepwise to adjust the viscosity of the mass during the process. Compared to sucrose, ERYLITE® is more brittle and therefore easier to grind. Depending on the recipe and the processing conditions, the required fineness is usually 30 microns or smaller. Erythritol also plays an important role in reducing the intensity of the bitter taste.

As ERYLITE® is non-hygroscopic and highly heat stable, with a melting temperature of 121°C, processing temperatures of more than 80ºC are feasible. Most polyols require lower conching temperatures to prevent the release of crystal water (inherently present in these ingredients) which would lead to an undesirable change in viscosity and clumping of the mixture. Xylitol has a melting temperature of 94°C and this temperature is easily reached whenever there is very high pressure on the particles.

Conching

The chocolate mass is kneaded to obtain a degree of homogeneity which allows taste and flavour to develop to the full extent. Chocolate producers distinguish between dry conching and liquid conching. In dry conching, the chocolate is slowly stirred at a temperature of around 70°C to eliminate any residual moisture and to increase viscosity. In liquid conching, extra cocoa butter and lecithin are added, reducing the viscosity of the mass and allowing kneading and flavour development at a lower temperature. Generally, higher conching temperatures result in enhanced and faster flavour development. Conching also eliminates some of the volatile bitter substances and acids.

Like sucrose, ERYLITE® is suitable for conching at higher temperatures since its crystals do not contain any bound water and its melting temperature is > 121°C. The viscosity of an ERYLITE® chocolate mass is slightly higher than that of a sucrose-based mass.

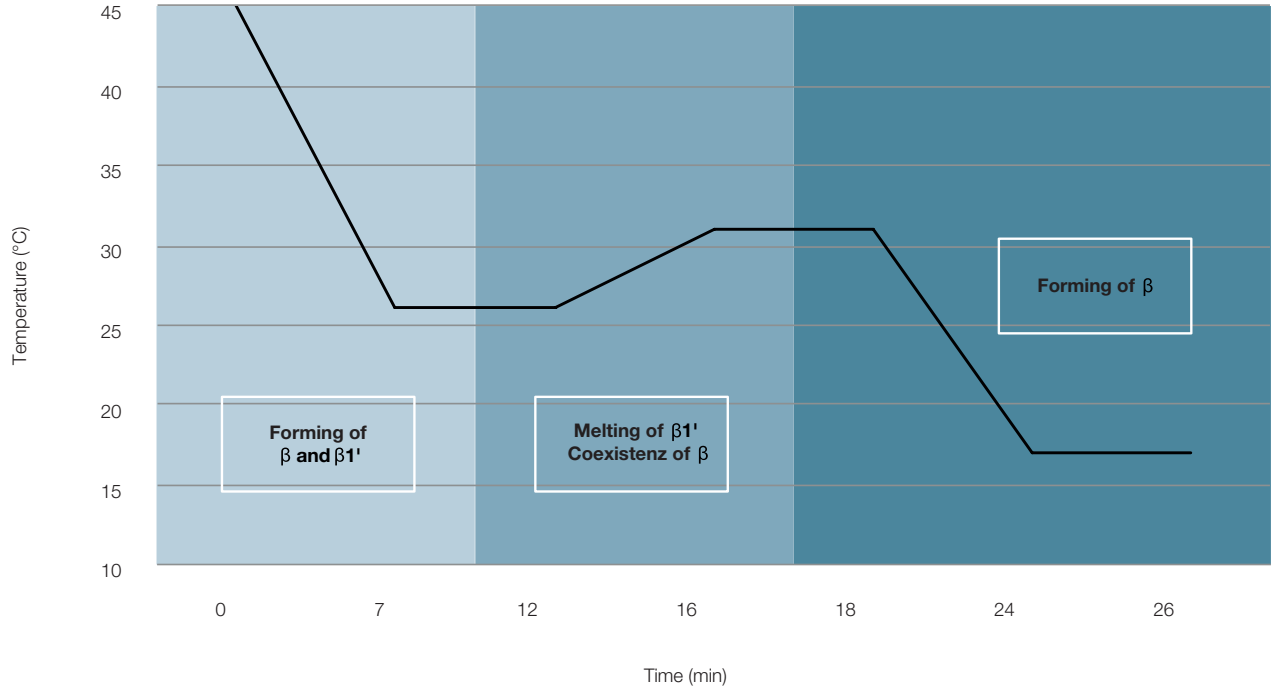
Tempering

The organisation of sugar crystals in the fat-rich chocolate during crystallisation is physically interesting. Sucrose crystals have a hydrophilic surface capable of adsorbing the lecithin (phospholipids) hydrophilic parts, resulting in structure-forming properties in the fat phase (Stortz, 2014; Saska and Myerson, 1983). Furthermore, this affects the structure formation of cocoa butter during crystallisation, after the tempering process (Vilgis, 2016).

Tempering affects mainly crystallisation of the fats in the chocolate mass. Their crystallisation behaviour is quite complex and the optimum beta crystal phase, with a melting point of 33.8°C, is obtained by very slowly cooling (tempering) the mass from 45/50°C to 27/29°C under shear forces. Subsequent reheating to 32/34°C redissolves unwanted β1 phase crystal structures, yielding the desired crystal modification.

The beta phase is the most useful in culinary terms. With a melting point of 33.8°C, this crystal structure in the mouth leads to perfect enamel and the aromas are released gradually and persistently. Fracture with the hand or biting feels smooth and instantaneous (Vilgis, 2016). ERYLITE® does not influence fat crystallisation and thus traditional tempering processes, as for sugar chocolate, may be used.

Figure 1: Temperature profile for chocolate crystallisation. Corresponding cooling rates, tempering times and temperatures promote the formation of the desired crystal form. Most important is tempering at 27°C (Vilgis, 2016).



Moulding

If the chocolate mass is not to be used for coating, e.g. in confectionery products, it is poured into moulds to set and to obtain its final shape. For the moulding process, the mass must have the right properties for exact dosing, equal spreading in the bar mould, deaeration in the mould and rapid cooling. Eventually the chocolate bars are removed from the bar moulds. Moulding ERYLITE® chocolate is as straightforward as moulding a sugar-based chocolate.

Conclusion

ERYLITE® Erythritol has excellent nutritional properties and advantages over other polyols as the calorific value in kcal/g and glycaemic index is zero. Furthermore it has much better digestive tolerance of around 0.8 g/kg body weight which allows a very high concentration in the chocolate formulation.

ERYLITE® Erythritol can be used effectively as a sugar replacement. It gives bulk to chocolate formulations, is well suited to the processing conditions and interacts with the main structural ingredients in a very similar way to sucrose.

This recipe for premium dark and milk chocolate with organic chocolate liquor has yielded an incomparably tasty product. This demonstrates that a clean label product can be formulated with the application of ERYLITE® Stevia in chocolate, without the use of additives such as emulsifiers and without vanillin.

Table 1: Recipes for Jungbunzlauer's pure chocolate with ERYLITE® Stevia

Jungbunzlauer – Dark Chocolate	
Ingredients	**Quantity**
Chocolate liquor (cacao mass Rondo)	60%
ERYLITE® Stevia 100	**35%**
Cacao butter	5%

Jungbunzlauer – Milk Chocolate	
Ingredients	**Quantity**
Chocolate liquor (cacao mass Rondo)	22%
ERYLITE® Stevia 100	**38%**
Milk powder (Ledor 26 S Spraydried)	17%
Cacao butter	23%

Directions

1 Liquefy the chocolate liquor and the cacao butter at 34°C (93.2°F) overnight

2 Prepare the ERYLITE® Stevia 100 and blend with the chocolate liquor. The blend should look crumbly like a dry blend rather than a paste

3 Add the mixture to a roller mill and feed continuously (alternatively, a ball mill can be used)

4 Run the blend through the mill two to three times (depending on the equipment used)

5 Add the mixture to a conche and run for six hours (depends very much on the cocoa quality and the desired result) at around 50°C (122°F)

6 After conching cool down to approx. 25°C (77°F)

7 Reheat to 32°C (89.6°F) and fill moulds

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About Jungbunzlauer

Jungbunzlauer is one of the world's leading producers of biodegradable ingredients of natural origin. We enable our customers to manufacture healthier, safer, tastier and more sustainable products. Due to continuous investments, state-of-the-art manufacturing processes and comprehensive quality management, we are able to assure outstanding product quality.

Our mission "From nature to ingredients®" commits us to the protection of people and their environment.

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