

trehalose



trehalose
the new multi-functional food ingredient

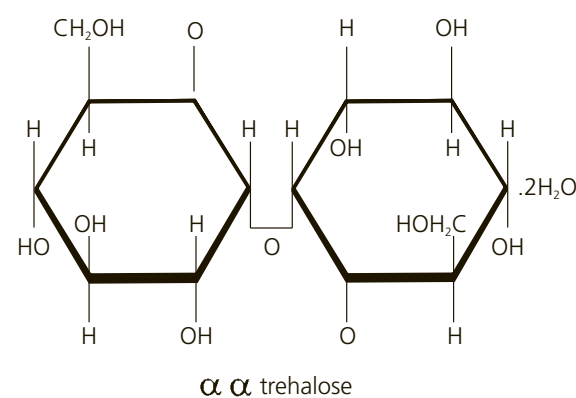
introduction

Trehalose is an exciting new multi-functional food ingredient with considerable potential for the food industry. It can be used by product developers either to improve existing products or to create innovative new products.

Trehalose is a naturally-occurring, non-reducing disaccharide consisting of two glucose molecules linked α α -1,1. It has excellent process and finished product stability.

Trehalose is a multi-functional sugar. Its mild sweetness, low cariogenicity, low hygroscopicity, high freezing-point depression, high glass transition temperature and protein protection properties are all of immense interest to food technologists. Trehalose is fully caloric, has no laxative effects and after ingestion is broken down in the body to glucose, but with an even blood glucose response, making it ideally suited for products formulated to provide sustained energy.

Trehalose is produced from starch by a proprietary enzymatic process developed by the Hayashibara Company, Okayama, Japan.



Formula

Anhydrous: $C_{12}H_{22}O_{11}$

Dihydrate: $C_{12}H_{22}O_{11} \cdot 2H_2O$

Molecular Weight

Anhydrous: 342.31 daltons

Dihydrate: 378.33 daltons

properties

Trehalose has a wide range of properties which can be utilised by food product developers.

Mild Sweetness

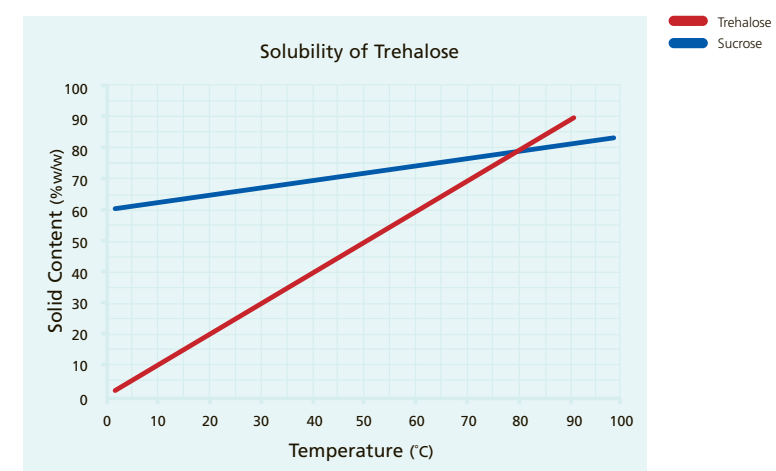
Trehalose is only 45% as sweet as sucrose. It has a clean taste profile with no aftertaste and a sweetness profile that is characterised by a rapid onset of sweetness with comparable persistence to sucrose.

Importantly, trehalose has similar functional properties to sucrose and can be used in food and beverage products in combination with sucrose and other bulk sweeteners to optimise sweetness thus allowing the full flavour of the product to be appreciated.



Solubility

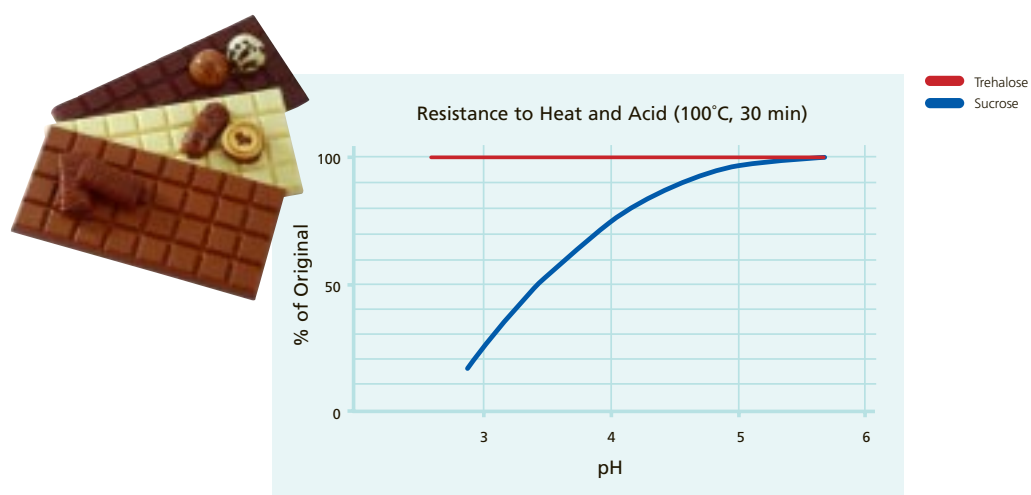
Trehalose is readily soluble in water. It is characterised by lower solubility at low temperatures but higher solubility than sucrose at high temperatures.



Process Stability

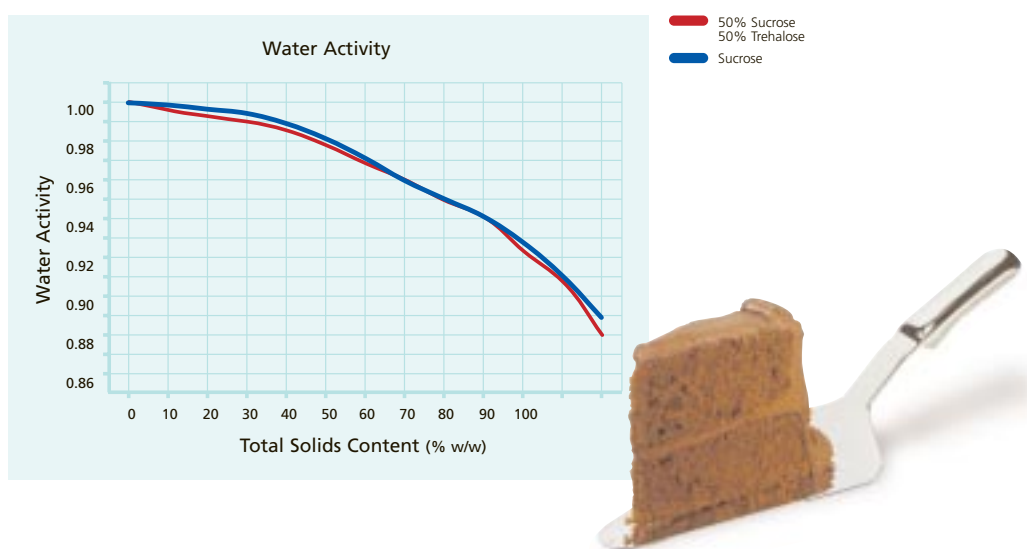
Trehalose is a non-reducing sugar and will not react chemically with amino acids or proteins during processing and storage. Owing to its unique chemical structure, trehalose remains stable under low pH conditions, even at elevated temperatures. Unlike other disaccharides it will not readily hydrolyse to its component parts and subsequently take part in Maillard reactions with amino acids and proteins.

In food and beverage products, the high stability of trehalose enables the original product characteristics to be retained even after heat processing and prolonged storage.



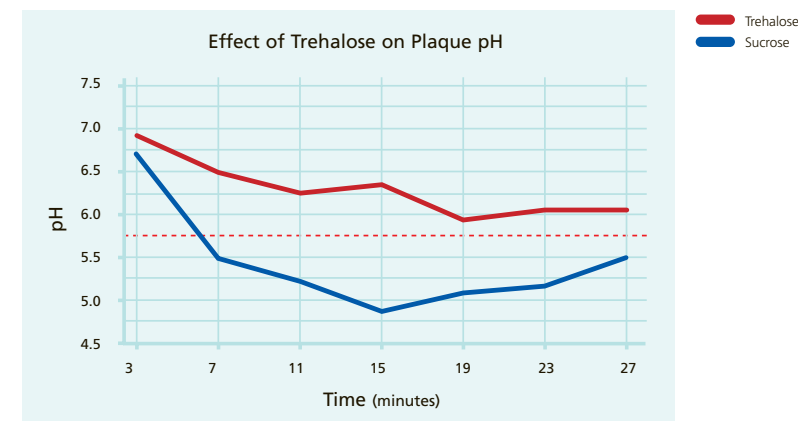
Reduction of Water Activity

Trehalose reduces water activity to the same extent as sucrose. Trehalose can therefore be used in combination with sucrose to optimise sweetness whilst maintaining product shelf life.



Low Cariogenicity

Trehalose has been shown to have substantially reduced cariogenic potential compared with sucrose and can therefore be used in the formulation of 'kind to teeth' and 'toothfriendly products' but without the laxative effects of other low-cariogenic bulk sweeteners.



Low Hygroscopicity

Crystalline trehalose is stable and remains free-flowing up to 94% relative humidity. It can reduce product caking when blended with other sugars and food ingredients. Food products or components coated with trehalose have enhanced stability, benefiting from the low hygroscopicity of the coating.

High Glass Transition Temperature

Trehalose has a high glass transition temperature compared with other disaccharides. This property, combined with its high process stability and low hygroscopicity, makes trehalose ideal as a protein protectant and ideally suited as a carrier for spray-dried flavours.

Depression of Freezing Point

Trehalose will depress the freezing point of a product to the same extent as sucrose. It can therefore be used in frozen foods including ice cream to modify texture whilst providing only mild sweetness.



applications

Trehalose, like other sugars may be used without restriction in a wide range of food products including beverages, chocolate and sugar confectionery, bakery products, frozen foods, breakfast cereals and dairy products.

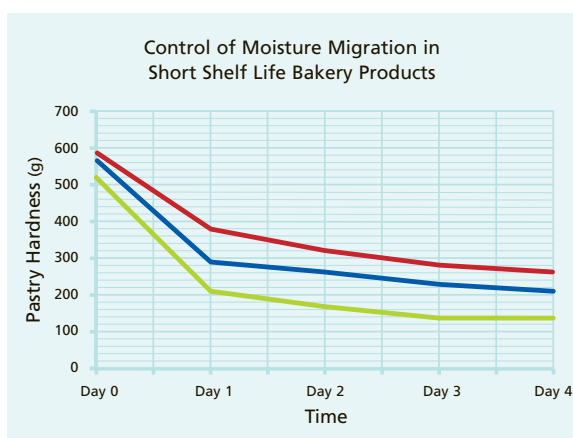


Bakery Products

Trehalose has many potential uses in bakery products: It moderates sweetness in cakes and biscuits, icings, bakery creams and fruit pie fillings allowing the full flavour potential of the product to be appreciated without compromising product shelf life.

It also facilitates fat reduction in sweet biscuits, bakery creams and frostings. In savoury biscuits and snacks,

trehalose can be used to create innovative texture sensations. It can improve consumer acceptability by optimising sweetness in highly caloric indulgent products containing high levels of fat and sugar. Trehalose reduces moisture migration in multi-component bakery products enabling optimisation of sweetness while maintaining product shelf life.

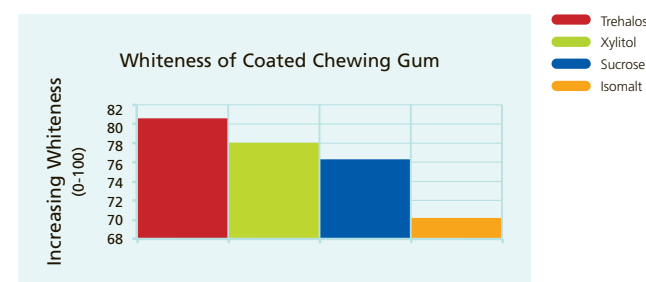
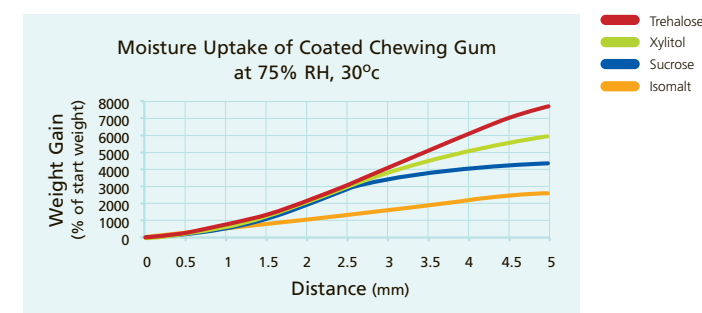
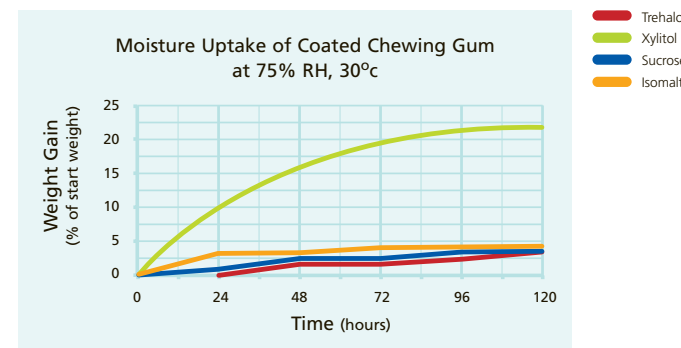


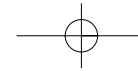
Sugar Confectionery

In combination with other bulk sweeteners, trehalose can be used in sugar confectionery, especially in high juice and herbal products, to moderate sweetness and thus allow the product's full flavour potential to be realised. This is particularly important for products intended for adult consumers. Trehalose is suitable for formulating 'kind to teeth' products. Trehalose is highly process stable and is not hydrolysed during processing.

Trehalose can be used to enrobe confectionery products to form a stable, non-hygroscopic coating. Owing to its high process stability, solutions of trehalose can be held at elevated temperature for prolonged periods without the risk of hydrolysis or colour generation.

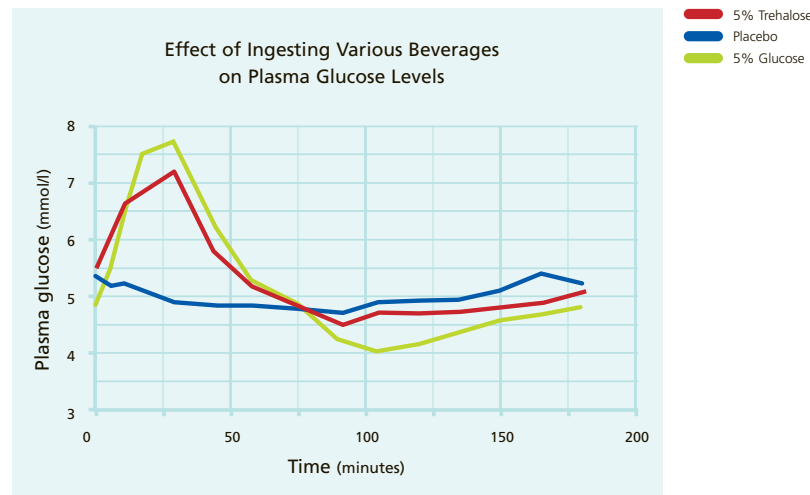
Trehalose is excellent for panning. The unique solubility characteristics of trehalose readily lend themselves to panning and the resulting coating is highly stable and robust with an improved whiteness relative to other bulk sweeteners.





Energy Products

Trehalose is metabolised to glucose but with a more balanced, even blood/glucose response compared to other sugars. This unique property, combined with its low cariogenicity and non-laxative effects, makes trehalose ideally suited for beverages and countlines formulated to provide sustainable energy and alleviate fatigue and stress.



Chocolate Confectionery

Use of trehalose moderates sweetness in chocolate confectionery. This is especially useful in filled products containing fondant creams and fruit fillings. Trehalose will also reduce moisture migration in multi-component countlines. In moulded products, the ability of trehalose to modify product sweetness offers the potential to create new chocolate taste sensations.

Due to its reduced cariogenicity, trehalose can be used to formulate 'kind to teeth' or 'toothfriendly' products either as the sole bulk sweetener or in combination with other low cariogenic bulk sweeteners. A special grade of trehalose has been developed for use with polyols in chocolate. This has a positive heat of solution when dissolved which minimises the characteristic cooling effect of certain polyols.



Fruit Products

Trehalose is excellent for optimising sweetness in processed fruit products including jams, fruit sauces, yogfruit and pie fillings. This allows the full flavour potential to be appreciated without compromising shelf life and improves product performance by increasing the soluble solids in the product. Additionally, owing to the high process stability of trehalose, hydrolysis does not occur and product colour is maintained.

Trehalose can be used in condiments and savoury sauces to create new flavour sensations by moderating sweetness whilst maintaining product shelf life.

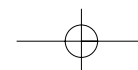
Frozen Foods

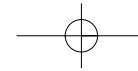
Trehalose acts like sucrose in depressing the freezing point of ice cream and other frozen foods. As it is less sweet than sucrose it can be used to create new textures in frozen foods and frozen confectionery products and provides the potential to create innovative frozen savoury products.



Beverages

Trehalose contributes mouthfeel and body to beverages but only mild sweetness. Trehalose can be used in combination with other bulk sweeteners to optimise sweetness thus enhancing overall flavour delivery. In alcohol-based beverages, trehalose provides mouthfeel without detracting from the sensory characteristics of the alcohol.

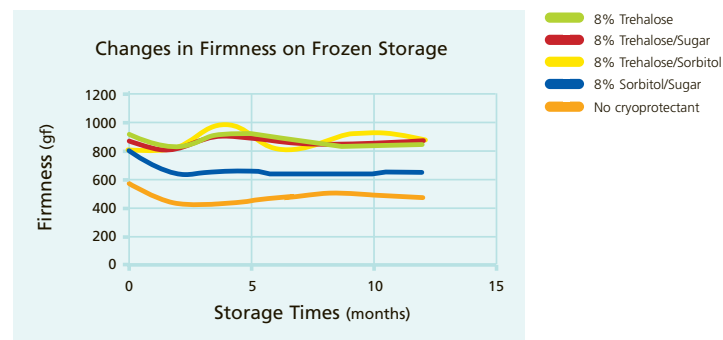
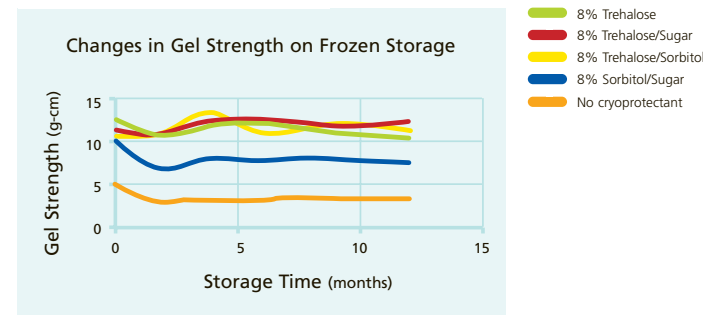
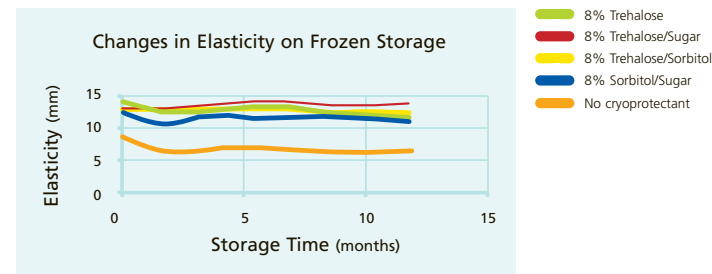




Surimi

Trehalose is particularly effective as a cryoprotectant for surimi. As trehalose positively controls water functionality at the protein/water interface, firmness, elasticity and gel strength of the surimi is improved. The low sweetness of trehalose also enhances the taste quality of the surimi. Unlike other cryoprotectants used in surimi manufacture, trehalose does not cause 'throat burn' and has no laxation problems.

Cyroprotectants in Surimi



technical support

Trehalose is a multi-functional sugar that can deliver significant benefits to your products, improving the performance and acceptability of your existing products or providing the means to create innovative new products.

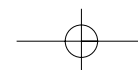
We can provide a full technical support service, from supplying samples of trehalose through to our food applications team helping you develop new products.

For further information on trehalose and details of your nearest agent please go to our website

www.trehalose.co.uk

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