

# SUNMALT™

*High purity Maltose*



## What is SUNMALT™ ?

SUNMALT™ from Hayashibara is a high purity maltose, which is a disaccharide consisting of two glucose molecules bound with an  $\alpha$ -1,4 linkage.

SUNMALT™ is produced by the enzymatic processing of starch.

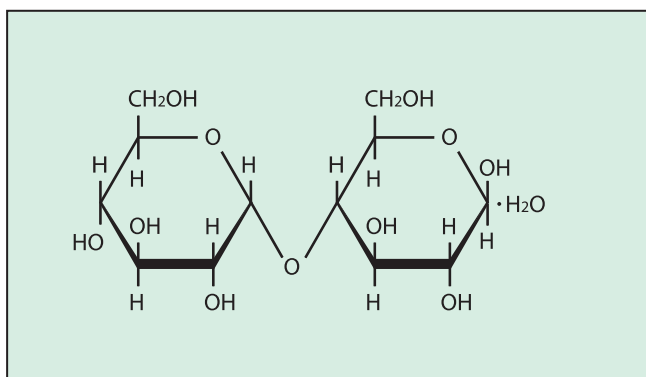


### Structure of Maltose (monohydrate)

Name:  $\alpha$ -D-Glucopyranosyl-(1 $\rightarrow$ 4)- $\beta$ -D-glucose monohydrate

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

Molecular weight: 360.31



### Maltose is found in Nature

Maltose is naturally found in most plants and animals as an intermediate substance.

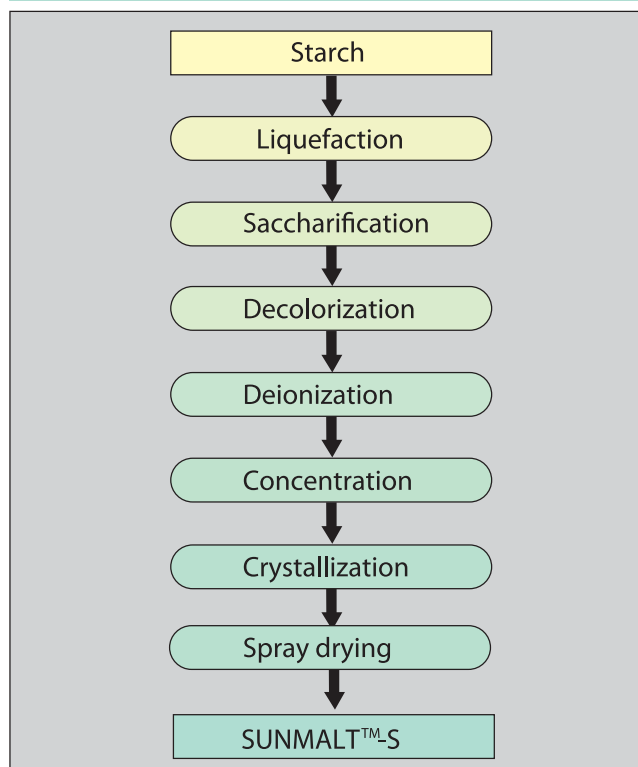
It is found in foods such as honey, oranges, grapes, nuts, and wheat-based products such as bread and beer. Maltose is used in a variety of foods and is one of the most common sweeteners consumed by humans.

### Specification (SUNMALT™-S)

Appearance	white powder
Loss on drying	not more than 7.0%
pH	4.0 ~ 5.5 (30% solution)
Glucose (on anhydrous basis)	not more than 3.0%
Maltose (on anhydrous basis)	not less than 92.0%

Specifications subject to change.

### Production of SUNMALT™-S



"SUNMALT" is a trade name and the registered trademark of Hayashibara's high purity maltose in Japan and many other countries.

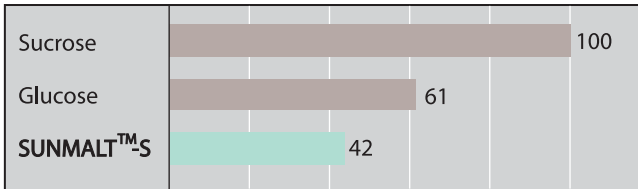
## Physical Properties

### ◆ Sweetness

SUNMALT™-S is only 42% as sweet as sucrose.

SUNMALT™-S has similar bulking properties as sucrose, so it can directly replace sugar if reduced sweetness is desired.

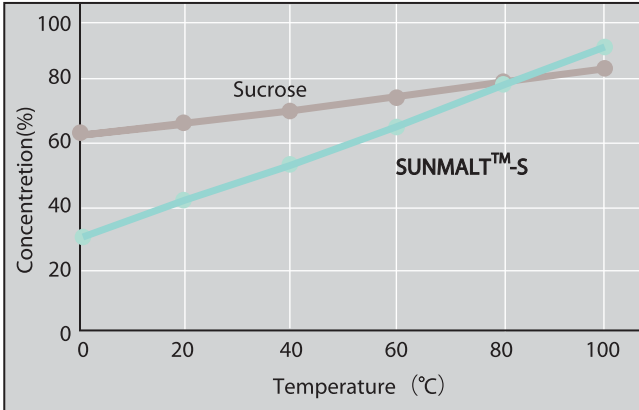
Relative percentage of sweetness



### ◆ Solubility

Below 80°C the solubility of SUNMALT™-S is lower than that of sucrose.

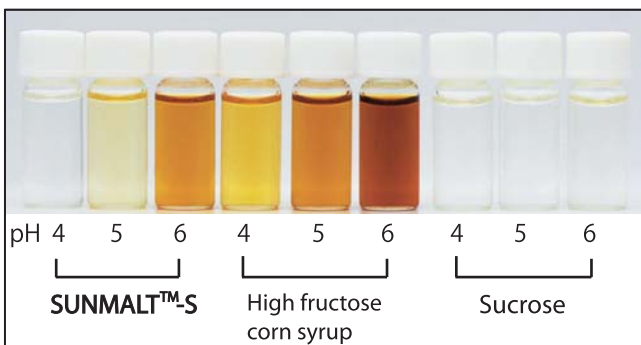
Solubility comparison at various temperatures



### ◆ Maillard reactions

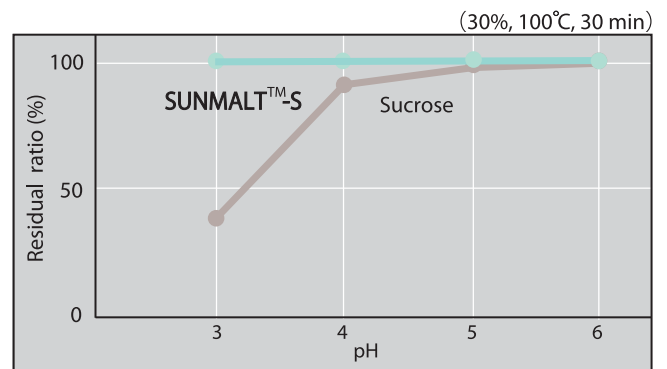
SUNMALT™-S is less likely than high fructose corn syrup to undergo the Maillard reaction with amino acids or proteins during heating.

Maillard reactions (A 12.5% solution of each saccharide and 0.5% glycine was heated at 120°C for 30 min)



### ◆ Heat/ Acid resistance

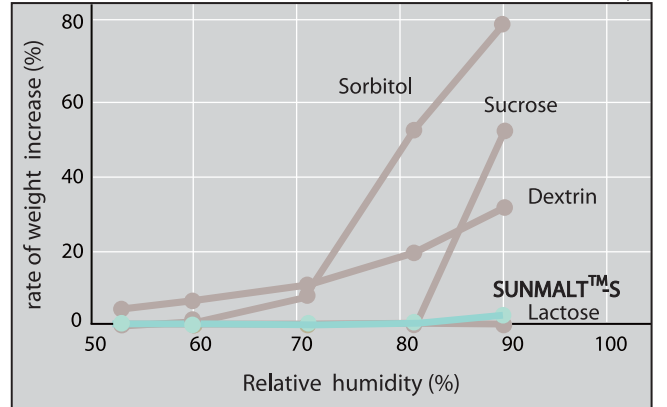
SUNMALT™-S is more stable than sucrose when exposed heat and acidic conditions, and therefore less likely to undergo decomposition.



### ◆ Hygroscopicity

SUNMALT™-S has low hygroscopicity.

Change in weight at various humidities



A 1g sample of each saccharide was held in a humidity controlled chamber to assess the change in weight due to water absorption.

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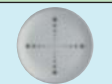
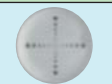
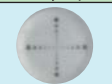
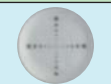




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## Functional Properties

### ■ Suppression of starch retrogradation

SUNMALT™-S is excellent at suppressing retrogradation of starch and effective in preserving the texture of foods containing starch.

#### Retrogradation test using starch gel

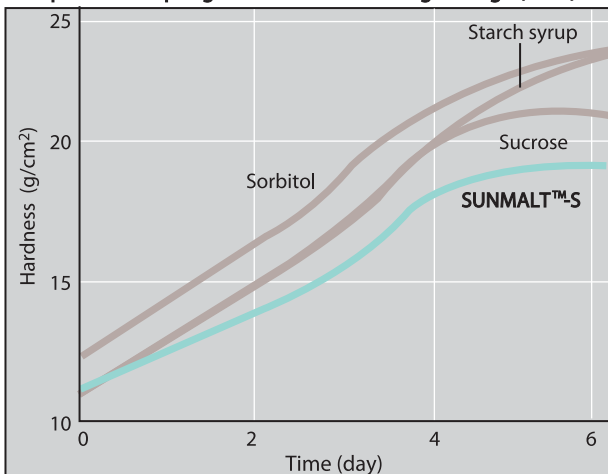
	Sucrose	SUNMALT™-S	High fructose corn syrup	Sorbitol
Initial				
After 4 freeze-thaw cycles				

Each saccharide was mixed with 6% modified starch and then heated until gelatinized. The gels were then placed in Petri dishes and stored in a freezer.

The gels were initially transparent.

Over 1 week, the gels underwent 4 cycles of freeze-thaw, with loss of transparency indicating that starch retrogradation had occurred. The starch gel containing SUNMALT™-S maintained a greater amount of transparency than gels containing the other saccharides.

#### Comparison of sponge cake hardness during storage (25 °C)



Sponge cakes were prepared in which SUNMALT™ -S, starch syrup, or sorbitol replaced about 20% of the sucrose.

All 4 cake formulations were stored at 25°C for 6 days and measured for hardness by rheometer.

### ■ Tableting properties

SUNMALT™-S has good flowability and low hygroscopicity, making it highly useful as an excipient for direct tableting.

### ■ Low melting point

SUNMALT™-S has a low melting point (111-128°C) so it is glazing agent for pies and cookies or at binding toppings.

#### Example as a bakery glaze



Sucrose



SUNMALT™-S

A freshly baked pie (200 °C, 14 min) was sprinkled with SUNMALT™-S or sucrose. SUNMALT™-S completely melts on the pie, making a lustrous glaze, while the sucrose forms a crumbly coating on the surface.

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## Examples in which SUNMALT™ is used

Purpose	Foods	Effects
Reduce sweetness	Various confectionaries, Chewing gum, Candy, Drinks, Fillings, Others	SUNMALT™-S is able to reduce the sweetness of processed foods by partially replacing sucrose, thereby preserving the original taste or flavor of ingredients.
Suppress starch retrogradation	Cake, Bouchee, Steamed rice, Pasta, Bread, Frozen foods, Others	SUNMALT™-S is used in place of sucrose for suppression of starch retrogradation. Further, when used together with sucrose it can reduce water activity by increasing the sugar ratio to prolong the shelf life of food products without greatly changing the sweetness.
Impart glaze	Pie, Cookie, Others	SUNMALT™-S has low melting point (111-128 °C) and is effective in imparting glaze to food products such as pies and cookies or binding toppings.
Tableting	Tablets, Molded confectionaries, Others	SUNMALT™-S has good flowability and low hygroscopicity, making it highly useful as an excipient for direct tableting.
Culture media	Carbon source	SUNMALT™-S can be used as a carbon source for culturing various microorganisms.

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