

# Allulose

Presentation by  
Primary Information Services

[www.primaryinfo.com](http://www.primaryinfo.com)

<mailto:primaryinfo@gmail.com>

## WHY Allulose?

Allulose is an ideal sweetener for those on ketogenic or reduced carb diets, as it has no impact on blood glucose or insulin levels when consumed in reasonable amounts.

Ketogenic and low carb diets are used for a host of reasons other than weight loss, but for those looking to lose body fat, allulose may be an ideal sweetener since it is nearly calorie-free and has been shown to have a small but notable impact on reducing body fat mass in humans.

## What is Allulose ?

Allulose is a monosaccharide epimer of fructose, formally called D-psicose. It's found naturally in jackfruit, figs, raisins, and maple syrup.

**Allulose is 70% as sweet as sucrose (sugar) with a very similar taste and texture, and no aftertaste**

Allulose's low glycemic index is attributed to its ability to not impact blood glucose levels.

**Studies show that when it's included in a meal containing carbohydrates, it actually improves glucose tolerance and insulin sensitivity.**

Because allulose is technically a sugar (and it bears the suffix “-ose”), the US FDA currently requires it to be listed as sugar in the Nutrition Facts panel on food labels, along with its full amount of carbohydrate and calories, even though allulose does not contribute calories to the diet.

**Because we lack the enzymes to digest allulose, it is largely excreted – primarily in the urine – and has very low colonic microbial fermentability; thus, no unpleasant GI effects.**

D-allulose is manufactured from fructose in aqueous solution by enzymatic epimerization in the presence of magnesium chloride. The enzyme used is an immobilized D-allulose-3-epimerase, which converts fructose to D-allulose

Prepare solution including fructose

Production of allulose syrup using immobilized cell system containing D-psicose 3-epimerase

Decolorization and desalting

Concentration

Allulose syrup ( $\geq 20\%$ )

Process Flow Chart





TABLE 1

### Products Containing Allulose

PRODUCT	SWEETENER STATEMENT
Allulite Rare Chocolate	All the taste of sugar without all the calories or impact on blood glucose
Fuze Meyer Lemon Black Tea; Fuze Tropical Mango Green Tea	Proprietary sweetener blend (sugar, allulose, stevia leaf extract)
Keystone Pantry Allulose Rare Natural Sweetener	Ultra low-calorie sugar
Keystone Pantry Flavored Syrups	Sweetened with allulose and monk fruit
Know Better Cookie	Near zero glycemic index
Lang's Reduced Calorie Chocolate Truffles	Truffles with indulgent experience, made with allulose
Quest Hero Bar	Sweeteners include allulose, erythritol, and sucralose

— SOURCE: LIST OF PRODUCTS CAME FROM SWEETENER MANUFACTURERS, VARIOUS WEBSITES, AND A FOOD AND BEVERAGE PRODUCT DATABASE. THIS ISN'T AN EXHAUSTIVE LIST; ADDITIONAL PRODUCTS ARE ON THE MARKET.

# Market

Global allulose market is segmented on the basis of its various application in various industries such as bakery, confectionary, dairy food and therapeutic food such as diabetic or weight management food. Increasing number of health issues associated with consumption of simple high calorie sugar, growing obesity rate, diabetic patients etc. are major factors causing consumers shift towards low calorie sweeteners.

# Literature Survey

In the next few pages.....

The screenshot shows a web browser window with the address bar containing a URL from Yahoo India Image Search. The page content includes:

- LITERATURE SURVEY** section with a table of 4 entries:

S/N	TITLE	ABSTRACT	TECHNIQUES	ADVANTAGES
1	Survey of plant life	Survey of plant life in the region of the study area.	Field survey, herbarium, etc.	Simple and easy to perform.
2	The Survey of plant life	Survey of plant life in the region of the study area.	Field survey, herbarium, etc.	Simple and easy to perform.
3	Survey of plant life	Survey of plant life in the region of the study area.	Field survey, herbarium, etc.	Simple and easy to perform.
4	Survey of plant life	Survey of plant life in the region of the study area.	Field survey, herbarium, etc.	Simple and easy to perform.

- WHAT IS A LITERATURE SURVEY/REVIEW?** section with a definition: "A literature survey or review is a text of a scholarly paper, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic."
- LITERATURE SURVEY** section with a table of 4 entries:

Phase of the survey	Author	Publication Date	Address	Notes
1	...	...	...	...
2	...	...	...	...
3	...	...	...	...
4	...	...	...	...

- LITERATURE SURVEY** section with a table of 4 entries:

Kind	Manipulation	Complexity type/ species	Geographical setting	Reference
Increase	2 weeks	Forest after crop	Mediterranean	Balderson et al. (1991)
Increase	2 weeks (significant)	Softwood forest	Central and eastern USA	Hallgren et al. (1991)
Decrease	3-10 days	Poplar tree saplings	Germany	Li and Dekamne (1992)
No effect	5 weeks	Temperate grassland and herb shrubland	Bavaria, Germany	...
No effect	1 weeks	Quercus forest	Northern Germany	Fuchs et al. (2009)
Increase	7 weeks	Temperate grassland	Thuringen, Germany	Kahmen et al. (2009)
Decrease	7 weeks	Phanerogam steppe	Hannover, Germany	Kage et al. (2006)
No effect	8 weeks	Quercus forest	Lower Saxony, Germany	Guger and Thomas (2002)
No effect	8 weeks	Heath-shrubland	UK, Denmark, The Netherlands, Spain	Groten et al. (2004)
Decrease	8 weeks	Pine after forest	Kjellerholm, Denmark	River et al. (1995)
Decrease	12 weeks	Early successional forest	Ampelador and Leuchner (2004)	...
Decrease	20 weeks	...	...	...
Decrease	Between 10 and 25 weeks	Sagebrush steppe	Sudan	Tejpal et al. (2005)
No effect	...	...	...	...

# Literature Survey

The screenshot displays a search results page for 'allulose' on Yahoo India. The browser address bar shows the search URL. Below the browser, a grid of images is visible, including:

- A large graphic with the word 'ALLULOSE' and a cartoon character.
- A product shot of a spoon with white powder and the text 'ALLULOSE The latest natural low-cal, low-sugar sweetener on the block'.
- A product box for 'Allulose' with the text 'The low caloric sugar'.
- A product shot of a white bag of 'Allulose Sweetener'.
- A graphic titled 'Allulose ... Keto Sugar?' showing a spoon with powder.
- A product shot of a blue and orange bag of 'Allulose'.
- A graphic with a clipboard and the text 'all about ALLULOSE'.
- A large graphic with the text 'Allulose A new way to think about sugar.' and a bowl of powder.
- Chemical structures for Fructose and Allulose.
- A product shot of a blue and white bag of 'Allulose'.
- A graphic titled 'Allulose - It's a Sugar' with a table comparing it to other sugars.
- A product shot of a blue and white bag of 'Sensato Allulose'.
- A graphic titled 'Global Allulose Industry Report 2015'.
- A graphic titled 'Making Sponge Cake Using Allulose as a Sweetener' with a line graph and a photo of a cake.
- A product shot of a blue and white bag of 'Sensato Allulose'.

...yahoo.com/.../view;\_ylt=AwrwS215OjBdWgwAEjO9HAX;\_ylu=X3oDMTlyc2ZhaWVpBHNIYwNzcgRzbGsDaW1nBG9pZANKYTK0OTZkNzNhNzNjZDQ4NDZjMjNkNDBIZGZIYmRiYwRncG9zAzkEaXQDYmlu...

# Literature Survey

MSDS-1.pdf - Adobe Acrobat Reader DC

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**SANTA CRUZ**  
BIOTECHNOLOGY

*The Power to Question*

## SAFETY DATA SHEET

Santa Cruz Biotechnology, Inc.  
Revision date 27-Aug-2018  
Version 1.6

### Section 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

#### 1.1. Product Identifier

Product Name	D-Psicose
Product Code	SC-221516
EC No	208-999-7
CAS No	551-68-8
Synonyms	D-Allulose; D-Ribo-2-hexulose
Pure substance/mixture	Substance

#### 1.2. Relevant identified uses of the substance or mixture and uses advised against

For research use only. Not intended for diagnostic or therapeutic use.

#### 1.3. Details of the supplier of the safety data sheet

Santa Cruz Biotechnology, Inc. Santa Cruz Biotechnology, Inc.

allulose - Yahoo India Imag... allulose market survey - Yah... Allulose - the hottest rare s... Convert HTML to...  
https://www.foodnavigator-usa.com/Article/2016/08/01/Allulose-the-hottest-rare-sugar-on-the-block-g...  
Allulose - the hottest rare sugar on the block gaining interest in the US  
By Stephen Daniells  
31-Jul-2016 - Last updated on 01-Aug-2016 at 14:08 GMT  
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Functionalized polyhydroxyalkanoa...

sciencedirect.com

Ingredient	D-allulose syrup	HiSweet 55	LYCASIN 80-55	POLYSORB 75/67	63DE #HiSweet 42 (50:50)
Pea protein	18.2	18.2	18.2	18.2	18.2
PowerProtein 515 WPC	18.2				
NUTRIOSE FM 06	7.3	7.3	7.3	7.3	7.3
Syrup	54.5	54.5	54.5	54.5	54.5
Canola oil	1.8	1.8	1.8	1.8	1.8
Total	100.0	100	100	100	100.0

Protein food product comprisin...

google.com

Protein food product comprising d ...

google.com

Ketose	Relative activity (%)
D-Allulose	100.0 ± 1.82
D-Fructose	41.1 ± 1.71
D-Tagatose	2.6 ± 0.07
D-Sorbose	6.9 ± 0.04
D-Xylulose	8.3 ± 0.16
D-Ribulose	10.5 ± 1.45

Data expressed as the mean of three separate experiments ± standard deviation.

doi:10.1371/journal.pone.0160044.t002

D-Allulose Production from D-Fructose ...

journals.plos.org

D-Psicose Is a Rare S...

researchgate.net

WO2016156117A1 - Chewing gum ...

google.ch

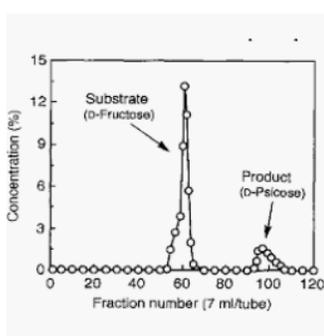
Composition	Hardening rate	
	(g-force/h)	(N/h)
1B	305.33	2.99
1B-1	327.70	3.21
1C	90.65	0.89
2A	5.73	0.06
2B	216.47	2.12

Mass Production of D-...

researchgate.net

D-psicose from D-fruct...

semanticscholar.org



**nutrients** **MDPI**

**A Preliminary Study for Evaluating the Dose-Dependent Effect of D-Allulose for Fat Mass Reduction in Adult Humans: A Randomized, Double-Blind, Placebo-Controlled Trial**

Youngji Han <sup>1,2</sup>, Eun-Young Kwon <sup>1,2</sup>, Mi Kyeong Yu <sup>1,2</sup>, Seon Jeong Lee <sup>1,2</sup>, Hye-Jin Kim <sup>3</sup>, Seong-Bo Kim <sup>3</sup>, Yang Hee Kim <sup>3</sup> and Myung-Sook Choi <sup>1,2,\*</sup>

<sup>1</sup> Department of Food Science and Nutrition, Kyungpook National University, 80 Daehakro, Bukgu, Daegu 41566, Korea; yyoungji.ker@knu.ac.kr (Y.H.); seonjeonglee@knu.ac.kr (S.J.L.); yyoungji@naver.com (M.K.Y.); end0001@knu.ac.kr (S.J.L.)  
<sup>2</sup> Center for Food and Nutritional Genomics Research, Kyungpook National University, Daegu 41566, Korea  
<sup>3</sup> Food R&D, CJ Cheiljedang Corp., 55, Gwanggyo-ro 42beon-gil, Yeongtong-gu, Suwon-si, Gyeonggi-do 16695, Korea; hyejin.kim@cj.net (H.-J.K.); seongbo.kim@cj.net (S.-B.K.); yanghee.kim@cj.net (Y.H.K.)  
 \* Correspondence: mschoi@knu.ac.kr; Tel.: +82-53-950-6232; Fax: +82-53-958-1230

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**Abstract:** D-allulose is a rare sugar with zero energy that can be consumed by obese/overweight individuals. Many studies have suggested that zero-calorie D-allulose has beneficial effects on obesity-related metabolism in mouse models, but only a few studies have been performed on human subjects. Therefore, we performed a preliminary study with 121 Korean subjects (aged 20–40 years, body mass index ≥ 25 kg/m<sup>2</sup>). A randomized controlled trial involving placebo control (sucralose, 0.02 g × 2 times/day), low D-allulose (D-allulose, 4 g × 2 times/day), and high D-allulose (D-allulose, 7 g × 2 times/day) groups was designed. Parameters for body composition, nutrient intake, computed tomography (CT) scan, and plasma lipid profiles were assessed. Body fat percentage and body fat mass were significantly decreased following D-allulose supplementation. The high D-allulose group revealed a significant decrease in not only body mass index (BMI), but also total abdominal and subcutaneous fat areas measured by CT scans compared to the placebo group. There were no significant differences in nutrient intake, plasma lipid profiles, markers of liver and kidney function, and major inflammation markers among groups. These results provide useful information on the dose-dependent effect of D-allulose for overweight/obese adult humans. Based on these results, the efficacy of D-allulose for body fat reduction needs to be validated using dual energy X-ray absorption.

**Keywords:** D-allulose; sugar substitutes; obesity; randomized-controlled trial

**1. Introduction**

Obesity, a hallmark of the metabolic syndrome, has increased to epidemic proportions worldwide and become a leading cause of morbidity [1–3]. Obesity changes the general metabolism of the body as well as its appearance [4]. It includes metabolic disorders such as type 2 diabetes, dyslipidemia, and cardiovascular diseases with inflammation [5]. According to the Korea National Health and Nutrition Examination Survey [6], the incidence of obesity (body mass index (BMI) ≥ 25 kg/m<sup>2</sup>) among adults over 19 years of age in Korea was 26% in 1998. Since then, it has been constantly increasing and reached 30.9% in 2014 (males, 37.7%; females, 23.3%). Further, the risk of developing

Nutrients 2018, 10, 100; doi:10.3390/nut102100

www.mdpi.com/journal/nutrients

# Patents

## Literature Survey

<input type="checkbox"/> 1	US20180049458	<b>ALLULOSE SYRUPS</b> The present invention relates to allulose syrups, use of allulose syrups in the manufacture of food or beverage products, and food and beverage products made using the allulose syrups.	999	
<input type="checkbox"/> 2	US20180279643	<b>CHEWING GUMS CONTAINING ALLULOSE</b> Chewing gums containing allulose and methods of making such gums are disclosed. In one embodiment, the gum comprises about 5% to about 95% gum base, about 0.1% to about 10% flavoring agent and...	804	
<input type="checkbox"/> 3	US20180271112	<b>CONFECTIONS CONTAINING ALLULOSE</b> A low calorie, low laxation confection such as chewy candy, hard candy, tableted candy, or gelled candy having acceptable texture, stability, clarity, and flavor delivery that contains a bulk...	771	
<input type="checkbox"/> 4	US20180271113	<b>CHEWING GUM COMPOSITION COMPRISING CRYSTALLINE ALLULOSE PARTICLES</b> The present invention pertains to a chewing gum composition comprising crystalline allulose particles and optionally an aqueous allulose syrup, and to the use of allulose for increasing the...	742	
<input type="checkbox"/> 5	US20180077958	<b>METHOD FOR MANUFACTURING ALLULOSE-CONTAINING SWEETENER COMPOSITION</b> The purpose of the present invention is to provide a technology whereby, in a method for manufacturing a sweetener composition containing glucose, fructose and allulose, said method comprising...	699	



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15:12

Literature Survey



US 20180077958A1

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**SHIMADA et al.** (43) **Pub. Date: Mar. 22, 2018**

(54) **METHOD FOR MANUFACTURING ALLULOSE-CONTAINING SWEETENER COMPOSITION**

**Publication Classification**

(71) Applicant: **MATSUTANI CHEMICAL INDUSTRY CO., LTD.**, Hyogo (JP)  
(72) Inventors: **Kensaku SHIMADA**, Hyogo (JP); **Pushpa Kiran GULLAPALLI**, Hyogo (JP); **Tomoya SHINTANI**, Hyogo (JP); **Seizo TAKAOKA**, Hyogo (JP)  
(73) Assignee: **MATSUTANI CHEMICAL INDUSTRY CO., LTD.**, Hyogo (JP)  
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(52) **U.S. Cl.**  
CPC ..... *A23L 27/33* (2016.08); *A23V 2002/00* (2013.01); *C12Y 501/03* (2013.01); *C12Y 503/01005* (2013.01)

(57) **ABSTRACT**

The purpose of the present invention is to provide a technology whereby, in a method for manufacturing a sweetener composition containing glucose, fructose and allulose, said method comprising treating glucose with glucose isomerase

questions?

Primary Information Services

[www.primaryinfo.com](http://www.primaryinfo.com)

<mailto:primaryinfo@gmail.com>