

LOW GI SUGAR The World's First All Natural Low GI Sugar





Prepared by The Product Makers (Australia) Pty Ltd, Technical, R&D & Bioactive Divisions 2016-2018, Copyright

TABLE OF CONTENTS

Introduction		2
1.	The LoGiCane™ innovation	2
2.	Origins	2
3.	Your healthier option	2
What LoGiCa	ine™ is?	3
1.	LoGiCane™ (Low GI sugar) description	3
2.	About the product	4
3.	Properties and mechanism of action	4
4.	LoGiCane™ benefits	5
Current pate	nts	6
Publications		6
Manufacturi	ng process for LoGiCane™	8
Testing meth	odology	10
1.	Low GI test	10
2.	Polyphenol of sugar test by Folin-Ciocalteu method	11
3.	Analysis from different LoGiCane™ sugar bags	13
Alternate ma	nufacturing and testing methodology	14
1.	Processing	14
2.	"Real-time" monitoring equipment	14
Product infor	rmation	15
1.	Specification details	15
2.	Safety data sheet	20
3.	Technical data sheet	25



Introduction

1. The LoGiCane[™] innovation

LoGiCane^m is the world's first all-natural low glycemic index (GI) sugarcane. A wholly Australian innovation, LoGiCane^m has the same sweetness and physical functionality as white sugar, but a significantly lower GI. Independently tested by the Sydney University Glycemic Index Research Service, LoGiCane^m has a GI < 55, compared to white sugar which has a medium GI of 68-70.

LoGiCane[™] retains more of the natural polyphenols, organic acids and minerals from sugarcane. It contains no chemical additives and has not been genetically modified. LoGiCane[™] can be fully substituted for regular white sugar.

2. Origins

In 2008 an opportunity arose to discover how natural purified sugar mill extracts could help the global diabetes and obesity crisis. Considerable research and development led a new proprietary process to address these issues. During this process, we learnt that an enormous amount of valuable phytochemicals (antioxidants) were being discarded during the raw sugar milling process.

In a breakthrough, it was found how to isolate polyphenols from the sugar mill processing extract and identified the right amount of polyphenols needed to deliver the best health benefits, particularly with respect to the best way to reduce low sugar levels. Current sugar production virtually strips all the goodness from the cane billets and directs them into the waste streams (traditional refining of raw sugar removes all bioactive phytochemicals). The retention of the right antioxidant phytochemicals, at the right levels, in sugar reduces the amount of glucose absorption. This was discovered for the first time around 2005 and this discovery was subsequently patented. [WO/2005/117608]

Phytolin[™] is a bioactive material that controls blood glucose levels and can also be used as a modulator of the digestion of carbohydrates such as sucrose, fructose, flours, cereals and polysaccharides. When our globally patented extract Phytolin[™] [WO/2014/032110] is used with sucrose, the result is our low GI sugar, LoGiCane[™], which features many health boosting, bioactive, anti-inflammatory properties that are not available in other such products.

3. Your healthier option

Made by Nature[™] and Proven by Science[™], the phyto-nutrients and antioxidant properties of Phytolin[™] combine to provide a natural healthier sweetener. LoGiCane[™] Low GI sugar also slows down digestion and helps manage blood glucose levels and is certified by the Glycemic Index Foundation.

Being high in polyphenols, LoGiCane[™] Low GI sugar provides key health benefits including reducing obesity, preventing the onset of type II diabetes while helping to manage blood glucose for both diabetes and non diabetes, plus may assist in weight control and loss.



What LoGiCane™ is?

1. LoGiCane[™] (Low GI sugar) description

- Low GI Sugar is a food grade straw colored crystalline sucrose product.
- It has a sucrose content of 98.8 99.2% and delivers the same sweetness level as white refined sugar.
- It contains a small amount (<0.6%) of a mixture of a natural cane phytochemicals, minerals and organic acids.
- These minor constituents alter the rate of sucrose digestion in the small intestine and the transport of glucose in to the bloodstream.
- The overall effect is to produce a sugar with a glycemic index (GI) of < 55.
- White refined sugar has a GI of 68-70.

Nutrition information

Ingredients: Cane Sugar Serving Size: 4g (1 level teaspoon)

	Per serving	Per 100g
Energy	68 kJ (16 Cal)	1690 kJ (404 Cal)
Protein	Og	Og
Fat		
- Total	Og	Og
- Saturated	Og	Og
Carbohydrate		
- Total	4g	99.4g
- Sugars	4g	99.4g
Sodium	Less than 0.1mg	Less than 2.5mg

Stability of LoGiCane™

Sugar as LoGiCaneTM, has an indefinite shelf-life when stored under proper conditions (dry, room temperature). The stability of LoGiCaneTM products has been studied in different packaging and under a variety of environmental conditions. The test parameters included purity, colour, appearance, moisture content, bulk density and microbe counts. All the microbe counts remained consistent and well within the limit of specifications during the 24-month test. These included total plate count (<100/g), yeast and mould (<100/g), coliforms (<10/g), and Salmonella (negative/25 g). When stored dry and at moderate temperatures, shelf life of the product was determined to be at least 24 months.



2. About the product

The LoGiCane[™] sugar granules is embodied by a new patented invention called Phytolin[™] which originates from sugarcane and other processing stream products having desirable properties and health benefits. More particularly the invention relates to extracts obtained from sugarcane processing by-product, methods of producing the extracts and uses of the extracts for management of insulin resistant conditions. This Phytolin[™] is polyphenol rich, high in antioxidants and can lower the GI of food or beverage. This increases the applicability of LoGiCane[™] in various aspects of diet and leading to better prospects of glycemic control among subjects who are having, or predisposed to, conditions associated with insulin resistance. In particular, the condition is type II diabetes.

The LoGiCane[™] sugar crystals have polyphenols and flavanoids captured within the sugar crystals as well as on the outside. The glucose from LoGiCane[™] is more slowly released into the blood than the glucose from regular white sugar, causing a lower, more controlled increase in blood glucose levels. The invention therefore seeks to manage the balance between the glucose response and the insulin response. This is likely to be better for people with glucose intolerance and diabetes, when compared with regular white sugar. Independently tested by the Sydney University Glycemic Index Research Service, LoGiCane[™] has a low GI of <55 [Low], as compared to white sugar which has a medium GI of 68-70. Though it does not justify an overall increase in sugar intake. LoGiCane[™] has approximately the same amount of energy (kilojoules or calories) per gram as regular white sugar, and like regular white sugar, should only be consumed in moderation, as part of a balanced diet.

3. Properties and mechanism of action

Dysfunctional metabolism of carbohydrates is a fundamental component of many dietary related disorders. It has been hypothesized that plant extracts containing high level of antioxidants may have the ability to stabilize carbohydrate regulation.

The Phytolin^M used to cover the LoGiCane^M sugar grain contains bioactives that exhibit antioxidation and anti-diabetic health functions. They inhibit the uptake of fructose in Caco-2 cells, mostly likely through inhibiting GLUT2 (glucose transporter) expression. In the meantime, they restored insulin production in insulin dysfunctional pancreatic β -cells.

Carbohydrate digestion

They are two mechanisms of action of Phytolin^M, the first one is the partially inhibition of intestinal α -glucosidase. This reduces the amount of glucose produced from sucrose.

The next step involves the inhibition of the glucose transporters. Monosaccharides such as glucose are transported from the small intestine to the blood stream by both active and passive systems, including a range of GLUT transporters located on the apical and the basal cell membrane adjacent to the lumen and the blood capillaries respectively where glucose is released into the blood.

Phytolin[™] inhibits both the enzymes listed above and as well as reducing the effectiveness of the active and passive transporters, SGLT-1 and GLUT-2 respectively, resulting in a lower glycemic response to foods containing sucrose. This is commonly referred to a low GI effect, which is a good dietary outcome for all consumers, pre-diabetics and type II diabetics. By reducing and controlling the blood glucose levels, less stress is place on the pancreas to continually produce insulin.



Antioxidant properties

Phytolin[™] is a powerful antioxidant which scavengers all types of free radicals in body cells thus extending their life, protecting their DNA and functional activity. The effect is to improve cellular and overall body heath.

Oxidative stress is therefore reduced by Phytolin[™] thus improving endothelial and vascular function and oxidation of low density lipoproteins resulting in protection against cardiovascular disease (CVD).

Phytolin[™] bioactives also upregulate an important transcription signalling protein called Nrf2 that is found in all mammalian body cells. Activation of this protein results in an increased endogenous production of all the natural antioxidant compounds and a range of antioxidant enzymes that can additional combat oxidative stress. Nrf2 is commonly referred to as the master redox regulator in the body.

Anti-inflammatory properties

Diabetes and obesity are inflammatory diseases and any intervention that reduces inflammation caused by cytokines released by inflamed cells is a positive outcome. Phytolin[™] bioactives have powerful anti-inflammatory properties that can reduce inflammatory cytokines. Phytolin[™] bioactive polyphenols can modulate these above conditions.

4. LoGiCane[™] benefits

The table below shows a comparison between the product composition of LoGiCane[™], raw (unrefined) cane sugar and refined white table sugar (sucrose). Whereas the mineral and phytochemical content of LoGiCane[™] falls within the range of that of raw sugar, its composition is by far more constant/stable and reproducible.

With a glycemic index of <55, LoGiCane[™] has a smaller impact on blood glucose, which is better for health and well being. LoGiCane[™] is made from 100% sugarcane and retains more of the natural antioxidant polyphenols, minerals and organic acids found in sugar cane. LoGiCane[™] is a healthier choice.

now does coorcane compare with white sugar.				
Component	Low GI Sugar Range	White Sugar (Comparison)		
Sucrose (%)	98.8 - 99.2	99.6 - 99.7		
Polyphenols (CE/100g)	25 - 40	0		
Antioxidant (mg GAE/100g)	6 – 12	0		
Organic Acids (mg/100g)	22 - 32	0		
Potassium (mg/kg)	300 - 400	0		
Calcium (mg/kg)	180 - 380	0		
Magnesium (mg/kg)	20 - 50	0		
Sodium (mg/kg)	20 - 32	0		
Colour (ICUMSA)	800 - 1350	< 200		
Glycemic Index	50 +/- 5	65 - 70		

How does LoCiCane[®] compare with white sugar?



Current patents

✓ Extraction method" PCT AU2013/000964 (WO/2014/032100) Phytolin[™] Method of extraction of bioactives, further fractionation, characterization of bioactive properties including polyphenols, antioxidant and anti-inflammatory properties.

✓ "Sugar Extracts" PCT/AU2012/000115 (W0212106761) Polynol™

Method of extraction and purification, LCMS data, compositional analysis, mouse clinical trial, weight loss and detailed biochemical & metabolic changes including endocrinology and gene expression changes and mechanism of action.

Natural Sweetener" PCT/AU2005/000798 (WO2005117608)
 Method of processing, GI reduction, analysis, uses and applications in foods and beverages

✓ "Substances Having Body Mass Redistribution Properties" PCT/AU2006/000769 (WO 2006/128259)

First clinical trials on mice. Demonstrates fat reduction, lean muscle mass increase, endocrinology, fecal energy increase, MRI's, DEXA.

✓ "Natural Preservatives and Antimicrobial Agents" PCT/AU2008/001458

Application of polyphenol extract from sugarcane in reducing fat rancidity, inhibition of a range of bacteria in vitro particularly Streptococcus mutants and a number of formulations for use in Oral Health eg Mouth washes, Toothpastes.

✓ "Extracts Derived From Sugarcane and a Process For Their Manufacture" PCT/AU2007/001382 (WO2008/034180)

Method of manufacturing sugarcane extracts using micro and Ultra Filtration and properties and use of the extracts

✓ "Sugarcane derived extracts and methods of treatment" PCT/AU2014/050187 (WO 2015/021512)

Use of a sugarcane extract to modify digestion and reduce glycemic index in standard foods in healthy and diabetic human subjects

Publications

- ✓ Ji, Jin, Xin Yang, Matthew Flavel, Zenaida P-I. Shields, and Barry Kitchen. "Antioxidant and Anti-Diabetic Functions of a Polyphenol-Rich Sugarcane Extract." *Journal of the American College of Nutrition* (2019): 1-11.
- Wright, Alison G., Timothy P. Ellis, and Leodevico L. Ilag. "Filtered molasses concentrate from sugar cane: natural functional ingredient effective in lowering the glycaemic index and insulin response of high carbohydrate foods." *Plant foods for human nutrition* 69, no. 4 (2014): 310-316.



Ellis, Timothy P., Alison G. Wright, Peter M. Clifton, and Leodevico L. Ilag. "Postprandial insulin and glucose levels are reduced in healthy subjects when a standardised breakfast meal is supplemented with a filtered sugarcane molasses concentrate." *European journal of nutrition* 55, no.8(2016):2365-2376.



 \checkmark

Manufacturing process for LoGiCane[™]

 ✓ <u>Step 1</u>: Mix Phytolin[™] 70 Brix syrup with raw or white refined sugar* (see note 1 below) in a large Z -arm horizontal mixer or similar equipment.

Sufficient Phytolin[™] has to be added to the sugar so that the product meets quality and bioactive specifications^{*} (see note 2 below). As a guide, a minimum of 300 grams of total polyphenols is required to be added to 1000 kg (1 tonne) of white sugar. The amount of Phytolin[™] required will vary slightly depending on the batch (each batch of Phytolin[™] will have a certificate of analysis for polyphenol levels per kg) so the amount required in production can be calculated.



Ribbon mixer shaft

- ✓ <u>Step 2</u>: Rather than using a blending process as described previously where either raw or refined sugar is used as the base for manufacturing LoGiCane[™], it can also be made in a Food Grade Mill as follows. These following steps were first used over 12 years ago when LoGiCane[™], the world's first all natural Low GI sugar, was manufactured prior to its launch in Australia and New Zealand in early 2009.
 - a. Following sugar crystallisation, the massecuite is fed either in batches or continuously into a centrifuge and washed with a water spray in a controlled manner, so the sugar crystals adhering to the outer bowl of the fugal mesh, reach a defined colour. The experienced fugal operator then stops the water spray and releases the raw sugar crystals through the base of the centrifuge.
 - b. The sugar crystals fall into a screw auger fitted with a number of calibrated spray nozzles installed across the centre top of the mixer. The Phytolin[™] can be sprayed (a dosing pump will be required) onto the sugar crystals that are evenly coated over the raw sugar crystals. The sugar emerging from the end of the auger has the right level of total polyphenols that eventually delivers the Low GI properties of the dry product.
 - c. Each batch should then be dried to a final moisture level of < 0.2%. Three different methods can be followed to reach this figure:
 - <u>A cylindrical rotating drum dryer fed with warm air</u>
 - <u>A fluid air bed dryer</u>: Used in the grain and milling industry. After mixing Phytolin[™] and sugar, the product obtained is put in a vibrating fluid bed dryer where hot air from below floats the product in the air and dries it quickly.



- <u>A screw conveyor</u>: The Phytolin[™] is directly spray injected into the screw conveyor and the air is blowing on the top to obtain a product mixed and dried.
- ✓ <u>Step 3</u>: The dried product can then be packed into 500g, 1kg, 2kg retail packs or into 15-25kg industrial/food service bags or 2-3g pencil packs for cafe/food service portions. Also, the product could be packed into 1 ton bulk bags or delivered to larger industrial users by bulk tanker and blown into storage silos.

*NOTE 1: If raw sugar is used, the PP level per 100g has to be determined first and then the amount in kg of Phytolin[™] to add to bring the final PP level to between 26-28mg/100g of the finished coated product.

*NOTE 2: Process/Quality Control: A number of samples should be taken from each mixed batch and analysed for total polyphenol content (TPPC) to ensure that the mean PP level meets the specification of 28+/-2mg per 100g of LoGiCane[™]. Also, together with the TPPC, a simple colour specification (absorbance reading at 270 and 420nm) can be used to confirm that the sugar crystals are evenly coated.



Testing methodology

This method is licensed under: AS 4694-2007 Glycemic index of foods and ISO 26642 GI Standard.

1. Low GI test

This study was conducted using internationally recognised GI methodology which has been validated by results in both small and large research trials. The study was conducted by Sydney University.

Conditions

- ✓ The reference food was dissolved in warm water.
- ✓ Subjects fasted for 10-12 hours before testing.
- ✓ Subjects consumed the reference food on 3 separate occasions and each subject consumed the test sugar on at least one occasion. 15 subjects consumed Low GI sugar on more than 1 occasion.
- ✓ Each session was completed on a separate morning with at least a day between subsequent sessions.

Experimental Procedure



Measurement of plasma glucose concentrations and GI values

Area under each 2 hour plasma glucose curve (AUC) was then calculated to obtain a single number which expresses the total increase in plasma glucose in that subject.

A GI value for wholemeal sugar sample was calculated for each subject by dividing their 2 hour blood glucose values for each test by their average two hour blood glucose AUC value for the reference food and multiplying by 100 to obtain a percentage value:

GI value for test food % = Plasma glucose AUC value for test food x 100



Average AUC value for the equal-carbohydrate portion of the reference food.

2. Polyphenol of sugar test by Folin-Ciocalteu method

Safety Precaution:

- Always wear protective gloves
- Reagent/Solution:
 - 200mg/L Gallic acid standard weigh out 200 mg ± 0.1 of gallic acid into a 1000 ml standard volumetric flask; make it up to the mark with distilled water. Close the lid and shake well to ensure all the gallic acid has dissolved. This solution should be prepared at the start of every week and kept out direct sunlight.
 - 7% Sodium Carbonate weigh out 70g of sodium carbonate into a 1000ml standard volumetric flask, add approximately 500ml of distilled water into the flask, place a stopper in the lid, and shake it gently until all the sodium carbonate has dissolved, then make the solution up to the mark with distilled water.
 - **Folin-Ciocalteu's Phenol Reagent** is purchased and bottled as a pre-made solution, and stored in the chemical cupboard.

Folin-Ciocalteu method:

Gallic Acid Standard

Prepare the following standards by pipetting the indicated volume on the below table into tests tubes with each gallic acid dilution being performed in triplicates.

Standard (ml)	200mg/L Gallic Acid Standard (ml)	Distilled Water (ml)	Total Volume (ml)
0	0.00	0.20	0.20
40	0.04	0.16	0.20
80	0.08	0.12	0.20
120	0.12	0.08	0.20
160	0.16	0.04	0.20
200	0.20	0.00	0.20

Blank - 0.20 ml of distilled water is placed into test tubes in triplicate. *Sample* - 0.20 ml of the diluted samples is placed into test tubes in triplicate.

Sample and standard preparation

1) 5g of sugar is dissolved in 10mL of water in a labelled 30mL test tube. The sugar/water mixture is vigorously vortexed and is left overnight to dissolve completely. Following this, the sample is again vortexed until no sugar particles remain.

- 2) Dispense 0.20 ml of the 6 standards/blanks/samples into test tubes as mentioned above.
- 3) Add 1.8 ml of distilled water into each test tubes



4) Add 0.20 ml of the Folin-Ciocalteu's phenol reagent in to each test tube, mix well with a vortex mixer for at least 5 seconds per sample and wait 5 minutes for the colour to develop (yellow/blue).

5) Add 2 ml of 7% sodium carbonate solution into each test tube. Upon addition the colour of each solution will develop a blue hue or will go clear for the 0 mg/L standard and blank test tubes.

6) Add 0.8 ml of distilled water into each test tube and ensure that each test tube is thoroughly mixed/vortexed for 5 seconds each and the samples are left at room temperature for 90 minutes to develop (note readings should be taken at this time, as the reagents will continue to react if longer than 90 minutes are allowed to pass).

7) Colour readings for each sample are then obtained using a UV-vis spectrometer at a wavelength of **750 nm**. The below "colour reading" procedure should be used for instruction on operating the spectrometer.

- Start the Varian spectrometer by double clicking "Cary WinUV" folder on the desktop screen of the PC, then click on "Simple Read", click [OK] and a simple read report screen will come up showing it is ONLINE.
- Click the [SET UP] button, enter the appropriate wavelength (750nm) and then click [OK].
- Record a color reading at 750 nm by employing the following procedure; fill distilled water or sample into a clean quartz cell, place the cell inside the spectrometer and then click [READ], this reading will be the blank/reading for the sample

8) All initial absorbance readings (\mathbf{R}_{750}) should be recorded down into a notebook for further data analysis, for each sample the dilution factor should also be written next to the absorbance readings recorded.

9) True absorbance readings for all the standards and samples are then calculated employing the formula;

Absorbance at 750 nm = R₇₅₀ – BLANK

10) Plot the gallic acid standard curve using Microsoft Excel, by entering all the data into the spread sheet and click on [Insert] – [Chart] – [XY (scatter)]; enter all necessary info, an example of what the standard curve should look like is displayed in FIGURE 1 below.

11) Right click on the graph area, choose [Add Trendline], choose [Linear], go to [Option] tab, click [Display equation on chart] & [Display R-square value].

12) If the R^2 value displayed on the chart is < 0.98, the test must be repeated.

13) Use the equation displayed on the chart (eg. Y = 0.0046X + 0.0262) to calculate the gallic acid concentration equivalents by using the true absorbance at 750 nm reading obtained from the spectrometer, employing the equation on the following page;

X = (Y-0.0262) / 0.0046



X = Gallic acid equivalents (mg/L)

Y = True absorbance at 750 nm

14) From calculating the obtained concentration of gallic acid equivalents using the above equation, the original concentration of total polyphenols in each sample can then be realized by employing the following equation;



Figure 1 Gallic acid example standard curve

15) The polyphenol results, provided in mg/L, are converted to mg/g via the following steps: Divide the mg/L results by 1000 to give mg/mL. Then multiply the given results by 13/5 (the total volume of solution in mL/the grams of sugar).

3. Analysis from different LoGiCane[™] sugar bags

Samples	Barcode Number	РКД	Target Markets	Polyphenol Levels (mg/g)	Flavonoids (mg/g)	Colour @420	Colour @270	Ratio	Moisture
1	9313010000641	22/05/2019	AUSTRALIA	0.294	0.073	1.302	13.406	10	0.05
2	9313010000641	23/05/2019	AUSTRALIA	0.288	0.067	1.242	12.828	10	0.10
3	9415272626000	3/06/2019	NZ	0.278	0.067	1.331	12.876	10	0.15
4	9313010000641	5/06/2019	AUSTRALIA	0.268	0.066	1.288	12.492	10	0.15
5	9313010000641	6/06/2019	AUSTRALIA	0.267	0.063	1.390	12.664	9	0.15
6	9313010000641	7/06/2019	AUSTRALIA	0.278	0.067	1.333	12.700	10	0.10
7	9313010000641	11/06/2019	AUSTRALIA	0.285	0.068	1.365	13.044	10	0.20



Alternate manufacturing and testing methodology

1. Processing

The sugar is then dried in a heated rotating drum dryer and after sieving, is delivered to a conveyer belt where "real-time" monitoring equipment measures the total polyphenol content in the sugar. This analytical information is a key part of the process control system which is fed-back to the fugal operator to if necessary, fine tune his step in the process. A quality control feed-back loop.

Note: This "controlled washing "procedure has been used for the last 50 years in sugar mills globally to produce different grades of raw sugar to colour and composition specified by refiners. These include grades in Australia such as International High Pol (IHP, Apparent Sucrose), Brand 1, and JA with colour ranging from light to dark as measured by the ICUMSA standard method. [Jansen (2009)]¹

As raw sugar colour and polyphenol levels are strongly correlated, the ICUMSA value, recognised by an experienced fugal operator, is a simple way to gauge the extent of water washing required in the fugal to produce the best raw sugar to convert into LoGiCaneTM.

2. "Real-time" monitoring equipment

Near Infra Red (NIR) monitoring

This technique has been widely used in the food industry for 40-50 years and it requires establishing algorithms between traditional wet chemistry, analytical methodology and responses from the NIR equipment. For on-line and "real-time" sugar analysis, such algorithms deliver analytical data for colour, polyphenols, total sucrose, reducing sugars and moisture levels accurately and rapidly.

TPM have the knowhow, experience and algorithms to assist customers to install this technology if required. $[WO/2009/043100, O'Shea and al.^{2}]$

Colour Monitoring (Neltec and HunterLab)

An alternative system involves equipment from Neltec⁴ and HunterLab³, which monitors sugar colour "on-line". As colour and polyphenol levels are strongly correlated, this equipment is a simple way of monitoring polyphenols for the above LoGiCane[™] manufacturing process. [Moodley and al.³] TPM and its sugar industry partners can assist customers if this approach is taken.

A combination of a controlled massecuite washing down process in the fugal linked to either a NIR² or a Neltec⁴ colour monitoring system has been used for over 25 years in factories in Australia to control colour (and hence polyphenols) of raw sugar products sold commercially.

Please contact us if you are interested in the above process and quality control processes.

¹¹Jansen (2009) *Proc Aust Soc Sugarcane Technol Vol 31, 512-520*

²O'Shea MG et al., Developing laboratory near infra-red (NIR): Instruments for the analysis of sugar factory products, *Proc Aust Soc Sugar Cane Technol.* (2011) Vol. 33

³Moodley M. et al., Evaluation of the Hunterlab colour measuring instrument, *Proc S Afr Sug Technol Ass* (1999) Vol.7 p.272

⁴Neltec, Real-time Color, Denmark <u>www.nelteck.dk</u>



Product information

1. Specification details



THE PRODUCT MAKERS

LOGICANE[™] LOW GI SUGAR PRODUCT SPECIFICATION

PRODUCTHigh quality, high pol (apparent sucrose), low GI sugar, made
from Australian grown sugarcane.DESCRIPTIONStraw-colored, free-flowing, crystalline material with a sweet
flavour and odour similar to raw sugar, free from extraneous
matter. Logicane™ Low GI sugar is a high quality product,
suitable for most food processing applications.COUNTRY OF ORIGINAustralia

LEGAL COMPLIANCE

This product shall comply with the provisions of any statutes, rules, standards and regulations relating to health, pure foods, weights and measures, trade practices, or others relating to the sale of food of all the relevant statutory authorities of the Commonwealth of Australia and its relevant States or Territories not withstanding nor in any way diminishing any requirement stated hereafter or in other documentation.



SPECIFICATIONS

Cane Sugar (Sucrose) Moisture (Loss on Drying) Colour (ICUMSA units) Polyphenols* Glycemic Index* >98% 0.3% max 800 – 1400 25-40mg CE/100g min 50 ± 5 BSES STD 30 BSES STD 31 BSES STD 33 FC Assay (Kim et al 2003) SUGiRS GI test

TYPICAL ANALYSIS

Cane Sugar (Sucrose) Moisture (Loss on Drying) Colour (ICUMSA units) Reducing Sugars Ash (Conductivity) Bulk Density 98.8 - 99.6% 0.3% max 800 - 1400 0.12 - 0.4% 0.10 - 0.4% 800-900 kg/m³

NUTRITIONAL INFORMATION (per 100 g of product)

Energy	1690 kJ
Protein	0
Fat	0
Carbohydrate – Total	99.4 g
- Sugar	99.4 g
Sodium	<2.5 mg

PACKAGING AND LABELLING

Product packaged in 1000kg IBC and placed on a pallet covered with a pallet pad. The IBC is covered with a pallet pad and then stretch wrapped. The label affixed to the IBC contains the following information: Low GI Sugar, pallet number, date and time bagged.

SHELF LIFE AND STORAGE CONDITIONS

Shelf Life 2 years minimum when held in stipulated storage conditions.

Storage Cool, dry environment, avoiding extremes of temperature conditions and humidity.



GENERAL INFORMATION

Polyphenols*	Kim, Dae-Ok, et al (2003) Antioxidant capacity of phenolic phytochemicals from various cultivars of plums. <i>Food Chemistry</i> , 81, 321-26.
Glycemic Index*	GI < 55 as tested by Sydney University Glycemic Index Research Service (SUGiRS)
GM Free	No raw materials or processing aids used in the manufacture of Logicane ™ Low GI Sugar are from genetically modified sources.
Allergen Free	Free of all known allergens and contains no sensitive ingredients.
Additive Free	No additives or preservatives present.
Halal	Suitable.
Kosher	Suitable.
	This product is manufactured in a HACCP certified facility.





INTERIM PRODUCT SPECIFICATION

003000 PHYTOLIN™

Product Description:

A patented bio-active natural extract from Sugarcane. It has a dark colour and imparts a pleasant bitter-sweet taste. At appropriate dosages, it lowers the Glycemic Index of sucrose based beverages and High GI food products. The syrup contains a natural variety of monophenols, polyphenols and flavanoids, all of which contribute to the high ORAC 6.0 level.

Ingredient Declaration:

Natural Extract (Sugarcane)

Legislative Status:

Natural It contains raw materials that are approved and comply with FSANZ (Food Standards Australia and New Zealand), EU and classified as GRAS under USFDA (CFR)

GMO Labelling Requirements:

Does not require labelling as per Standard 1.5.2 of the Australia New Zealand Food Standards Code

Physical Properties:

Appearance/Form: Dark Brown liquid Aroma: Sweet treacle aroma Shelf Life: 24 months according to the specified storage conditions Application/Dosage: As per application Specific Gravity: 1.35 +/-0.02 (at 20°C)

pH 4.6 +/-0.4

Brix: Min 70

Total Polyphenols: Min 20 mg/ as Gallic Acid equivalents

ORAC 6.0*: Min 190,000 µmoles per 100g (as TE)

*Analytically tested by Brunswick Laboratories USA

Identification

Each package of product is identified with the product name, product code, pack size and batch number.

Packaging:

The package is an approved package for shipment and general storage. The package is sealed with a tamper evident seal.

While the suggestions and data contained herein are based on information believed to be reliable, it is only a guide to effective working procedures and practices for this product. It is the responsibility of the purchaser to evaluate and determine its optimum use within their manufacturing environment. The uses or recommendations described herein should not be construed as permission to violate any patent or as a warranty of non-infringement of any patent.



THE PRODUCT MAKERS

The Product Makers (Australia) Pty Ltd ABN 48 007 217 496 50-60 Popes Road, Keysborough Victoria, 3173, Australia Telephone: 61 3 9771 0300 Fax: 61 3 9771 0301 Email: info@tpm.com.au Web: www.theproductmakers.com



INTERIM PRODUCT SPECIFICATION

003000 PHYTOLIN™

THE PRODUCT MAKERS

The Product Makers (Australia) Pty Ltd ABN 48 007 217 496 50-60 Popes Road, Keysborough Victoria, 3173, Australia Telephone: 61 3 9771 0300 Fax: 61 3 9771 0301 Email: info@tpm.com.au Web: www.theproductmakers.com

Storage Conditions:

Store tightly closed under cool dry conditions in an approved storage area at 25 degrees C. Once opened, product must be kept in an approved storage area under 25 degrees C and be used within 3 months. Avoid exposure to light.

MATERIALS HANDLING INFORMATION:

Non -Dangerous according to the criteria classification of Australian Dangerous Goods Code 2007 Non -Hazardous according to the criteria classification of NOHSC / Worksafe Australia.

Prepared By:Approved By:Stefanie PrendergastGregor MacnabBioactive TechnologistTechnical Director

While the suggestions and data contained herein are based on information believed to be reliable, it is only a guide to effective working procedures and practices for this product. It is the responsibility of the purchaser to evaluate and determine its optimum use within their manufacturing environment. The uses or recommendations described herein should not be construed as permission to violate any patent or as a warranty of non-infringement of any patent.



2. Safety data sheet



003000 PHYTOLIN™

The Product Makers (Australia) Pty Ltd

Version No:2.2 Safety Data Sheet according to WHS and ADG requirements Chernwatch Hazard Alert Code: 1

S.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier Product name: 003000 PHYTOLIN™ Chemical Name: sugar cane extract Other means of identification: Not Available

Relevant identified uses of the substance or mixture and uses advised against Relevant identified uses: Personal careproduct.

Details of the supplier of the safety data sheet

Registered company name	The Product Makers (Australia) Pty Ltd
Address	50 - 60 Popes Road Keysborough 3173 Australia
Telephone	61 3 977 1 0300
Fax	61 3 977 1 0301
Website	www.theproductmakers.com
Email	Not Available

Emergency telephone number	
Association / Organisation	Not Acilable
Emergencytelephone numbers	613 977 10300
Other emergency telephone numbers	Not Agilable

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

NON-HAZARDOUS CHEMICAL NON-DANGEROUS GOODS. According to the WHS Regulations and the ADG Code. COMBUSTIBLE LIQUID, regulated for storage purposes only

ChemWatch Hazard Ratings

	Min	Notane i
Flammability	1	A REAL PROPERTY AND A REAL
Toxicity	0	0 = Minimum
Body Contact	0	2 = Moderate
Reactivity	1	3 = High
Chronic	0	¦4≃ Boheme
Poisons Schedule	Not Applicable	e
Classification ^[1]	Not Applicable	e
Label elements		
GHS label elements		
Not Applicable		
SIGNAL WORD N	TAPPLICABL	E
		11.000
Hazard statement(: Not Applicable	s)	
Precautionary stat Not Applicable	ement(s) Pre	evention
Precautionary stat Not Applicable	ement(s) Re	sponse
Precautionary stat Not Applicable	ement(s) Sto	orage



Version No: 2.2

Page 2 of 6

003000 PHYTOLIN™

Precautionary statement(s) Disposal Not Applicable

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

91722-22-4 100	sugar cane extract

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact

- If this product comes in contact with eyes:
- Wash out immediately with water.
- If irritation continues, seek medical attention. ► Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact

- If skin or hair contact occurs:
 - Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation. For thermal burns:
- ► Decontaminate area around burn. Consider the use of cold packs and topical antibiotics.
- For first-degree burns (affecting top layer of skin)
- + Hold burned skin under cool (not cold) running water or immerse in cool water until pain subsides.
- Use compresses if running water is not available.
- + Cover with sterile non-adhesive bandage or clean cloth
- Do NOT apply butter or ointments; this may cause infection.
 Give over-the counter pain relievers if pain increases or swelling, redness, fever occur.
- For second-degree burns (affecting top two layers of skin)
- ► Cool the burn by immerse in cold running water for 10-15 minutes.
- Use compresses if running water is not available.

- Do NOT apply ice as this may lower body temperature and cause further damage.
 Do NOT break blisters or apply butter or ointments; this may cause infection.
 Protect bum by cover loosely with sterile, nonstick bandage and secure in place with gauze or tape. To prevent shock: (unless the person has a head, neck, or leg injury, or it would cause discomfort):
- Lay the person flat.
- + Elevate feet about 12 inches.
- Elevate burn area above heart level, if possible.
 Cover the person with coat or blanket.
- Seek medical assistance.
- For third-degree burns Seek immediate medical or emergency assistance.
- In the mean time
- + Protect burn area cover loosely with sterile, nonstick bandage or, for large areas, a sheet or other material that will not leave lint in wound.
- Separate burned toes and fingers with dry, sterile dressings.
- + Do not soak burn in water or apply ointments or butter; this may cause infection.
- To prevent shock see above.
- For an airway burn, do not place pillow under the person's head when the person is lying down. This can close the airway.
- Have a person with a facial burn sit up.
 Check pulse and breathing to monitor for shock until emergency help arrives.

Inhalation

- + If fumes, aerosols or combustion products are inhaled remove from contaminated area.
- Other measures are usually unnecessary.

Ingestion

- Immediately give a glass of water.
- + First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.
- Indication of any immediate medical attention and special treatment needed Treat symptomatically,

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

► Foam.

Special hazards arising from the substrate or mixture

Fire Incompatibility

+ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result

Advice for firefighters



Version No: 2.2

Page 3 of 6

003000 PHYTOLIN™

Fire Fighting

Alert Fire Brigade and tell them location and nature of hazard.

Fire/Explosion Hazard

Combustible.

Combustion products include; carbon dioxide (CO2) other pyrolysis products typical of burning organic material

HAZCHEM

Not Applicable

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures See section 8

Environmental precautions See section 12

Methods and material for containment and cleaning up

Minor Spills

Remove all ignition sources.

Major Spills

Moderate hazard.

Personal Protective Equipment advice is contained in Section 8 of the SDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling

Avoid all personal contact, including inhalation.

Other information

24 months if the product is sealed and kept under cool, dry conditions in an approved storage area at 20°C. Once open, product must be kept refrigerated and be used within one month.

Conditions for safe storage, including any incompatibilities

Suitable container

 Metal can or drum Packaging as recommended by manufacturer.

Storage incompatibility

Avoid contamination of water, foodstuffs, feed or seed. Avoid reaction with oxidising agents

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

Occupational Exposure Limits (OEL)

INGREDIENT DATA Not Available

Exposure controls

Appropriate engineering controls

Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard.

Personal protection



Eye and face protection

 Safety glasses with side shields Chemical goggles.

Skin protection

See Hand protection below

Hands/feet protection

Wear general protective gloves, eg. light weight rubber gloves. The selection of suitable gloves does not only depend on thematerial, but also on further marks of quality which vary from manufacturer tomanufacturer.

Body protection

See Other protection below



ersion No: 2.2		Page 5 d	of 6			
		003000 PH	YTOLIN™			
Mutagenicity		Aspiration Hazard				
				Legend:	X − Data available but doe. → Data required to make ○ − Data Not Available to n	s not fill the criteria for classification classification available nake classification
SECTION 1	2 ECOLOGICAL INFORMATI	ON				
Foxicity						
Ingredient	Endpoint T	est Duration (hr)	Species		Value	Source
Not Available	Not Applicable	lot Applicable	Not Applicable		Not Applicable	Not Applicable
Legend:	Extracted from 1. IUCLID Toxicity D (Estimated) 4. US EPA, Ecotox data Bioconcentration Data 8. Vendor Da	ata 2. Europe ECHA Registered Sub base - Aquatic Toxicity Data 5. ECET ta	stances - Ecotoxicologica OC Aquatic Hazard Asse	al Informatic essment Da	n - Aquatic Toxicity 3. EPIWIN 5 ta 6. NITE (Japan) - Bioconcent	Suite V3.12 - Aquatic Toxicity Data ration Data 7. METI (Japan) -
	and degradability		Bioaccumu	lative po	tential	
Persistence	and acgradatinty					
Persistence Ingredient	Persistence: Water/Soil	Persistence: Air	Ingredient	Bioaccu	umulation	
Persistence Ingredient	Persistence: Water/Soil No Data available for all ingredients	Persistence: Air No Data available for all ingredie	Ingredient nts	Bioaccu No Data	available for all ingredients	
Persistence Ingredient Mobility in s	Persistence: Water/Soil No Data available for all ingredients	Persistence: Air No Data available for all ingredie	Ingredient	Bioaccu No Data	umulation available for all ingredients	
Persistence Ingredient Mobility in s Ingredient	Persistence: Water/Soil No Data available for all ingredients soil Mobility	Persistence: Air No Data available for all ingredie	Ingredient	Bioacci No Data	umulation available for all ingredients	

Waste treatment methods

Product / Packaging disposal

SECTION 14 TRANSPORT INFORMATION

Labels Required

	Land transport (ADG): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS	Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS	Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS
UN number: Not Applicable			
UN proper shipping name: Not Applicable			
Transport hazard class(es): Not Applicable			
Subrisk: Not Applicable			
Packing group: Not Applicable			

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

sugar cane extract(91722-22-4) is found on the following regulatory lists

Australia Inventory of Chemical Substances (AICS)	

National Inventory	Status
Australia - AICS	Ŷ
Canada - DSL	N (sugar cane extract)
Canada - NDSL	N (sugar cane extract)
China - IECSC	Y
Europe - EINEC / ELINCS / NLP	Y
Japan - ENCS	N (sugar cane extract)
Korea - KECI	N (sugar cane extract)
New Zealand - NZIoC	Y
Philippines - PICCS	Ŷ
USA - TSCA	N (sugar cane extract)



Version No: 2.2

Page 6 of 6

003000 PHYTOLIN™

Legend:

Y = All ingredients are on the inventory N = Not determined or one or more ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment.

This document is copyright.



3. Technical data sheet

TECHNICAL DATA SHEET 003000 PHYTOLIN[™]



THE PRODUCT MAKERS

The Product Makers (Australia) Pty Ltd ABN 48.007.217.496 50-60 Popes Road, Keysborough Victoria, 3173, Australia Telephone: 61.3.9771.0300 Fax: 61.3.9771.0300 Email: info@tpm.com.au Web: www.theproductmakers.com

PHYSICAL AND BIOACTIVE PROPERTIES:

Appearance:	Dark brown liquid
Aroma:	Sweet treacle aroma
Density:	1.35 (+/- 0.02 @ 20°C)
Brix:	Min 70° @ 20°C
pH:	4.6 (+/- 0.4) @ 20°C
Conductivity:	80,000 – 190,000 S/m

Total Polyphenols: Min 20 milligrams per ml (as Gallic acid equivalents)

Colour Absorbance Readings:

@270nm: 1,200 - 1,700

@420nm: 60 - 90

A270/A420: 10 - 25

Total Flavonoids: Min 7 milligrams per ml (as Catechin equivalents)

2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid) (ABTS): Min 3,000 milligram per litre

Ferric Reducing Ability of Plasma (FRAP): Min 80 umol per litre (as trolox equivalents)

Proanthocyanidins (PAC): Min 2,000 milligram per litre

ORAC 6.0*: Min 190,000 µmoles per 100gm (as trolox equivalents)

Cellular Antioxidant Assay (Bioavailability)*: Min 50,000 umoles per Litre (as quercetin equivalents) * Analytically tested by Brunswick Laboratories USA

MINERAL CONTENT (per 100ml):

	100
Sodium	60 - 180 mg
Potassium	2000 - 4000 mg
Calcium	40 - 130 mg
Iron	1 - 10 mg
Magnesium	240 - 550 mg
Zinc	0.3 - 0.8 mg

ESSENTIAL TRACE ELEMENTS

Selenium Chromium 0.03 - 0.09 mg 0.03 - 0.140 mg

Important Notice:

While the suggestions and data contained herein are based on information believed to be reliable, it is only a guide to effective working procedures and practices for this product. It is the responsibility of the purchaser to evaluate and determine its optimum use within their manufacturing environment. The uses or recommendations described herein should not be construed as permission to violate any patent or as a warranty of non-infringement of any patent.





TECHNICAL DATA SHEET 003000 PHYTOLIN[™]

THE PRODUCT MAKERS

The Product Makers (Australia) Pty Ltd ABN 48.007 217 496 50-60 Popes Road, Keysborough Victoria, 3173, Australia Telephone: 61 3 9771 0300 Fax: 61 3 9771 0301 Email: info@tpm.com.au Web: www.theproductmakers.com

MICROBIOLOGICAL PROPERTIES:

Standard Plate Count	<1,000 cfu/g
Salmonella:	absent / 25g
E.Coli :	<10 cfu/g
Yeasts:	<100 cfu/g
Moulds:	<100 cfu/g
Coliforms:	<10 cfu/g
Osmophillic Yeast:	< 10 cfu/g
Osmophillic Moulds:	< 10 cfu/g

NUTRITIONAL INFORMATION (per 100 ml):

Energy:	1360 kJ
Protein:	3.1 g
Total fat:	<0.1 g
Saturated fat:	<0.1 g
Cholesterol:	0.0 g
Carbohydrate:	60.3 g
Total sugar:	44.3 g
Total Ash	6.5 g

HEAVY METALS (per Kg)

Arsenic	<0.1 mg
Cadmium	<0.1 mg
Lead	<0.1 mg
Mercury	<0.1 mg
Tin	<0.1 mg

ALLERGEN INFORMATION:

Royal jelly	No
Bee pollen	No
Propolis	No
Wheat	No
Rye	No
Barley	No
Oats	No
Spelt	No
Crustacean	No
Egg	No
Fish	No
Milk	No
Peanuts & Tree Nuts	No
Soybean	No
Sesame-seeds	No
Added Sulphites > 10mg/Kg	No

Total Amino Acids (ug/g): 4500 - 10500 Essential Amino Acids / Total Amino Acids: 15% - 30% Free Amino Acids (ug/g): 1800 - 4100

Important Notice: While the suggestions and data contained herein are based on information believed to be reliable, it is only a guide to effective working procedures and practices for this product. It is the responsibility of the purchaser to evaluate and determine its optimum use within their manufacturing environment. The uses or recommendations described herein should not be construed as permission to violate any patent or as a warranty of non-infringement of any patent.





TECHNICAL DATA SHEET 003000 PHYTOLIN[™]

Essential Amino Acids / Free Amino Acids: 15% - 30%

UV-VIS Scan (200-800nm)

TPM BIO Active 6/10/2016 1:39:38 PM Page 1 of 1

TPM Instrument Serial Number EL04104030



The Product Makers (Australia) Pty Ltd ABN 48 007 217 496 50-60 Popes Road, Keysborough Victoria, 3173, Australia Telephone: 61 3 9771 0300 Fax: 61 3 9771 0301 Email: info@tpm.com.au Web: www.theproductmakers.com



Important Notice: While the suggestions and data contained herein are based on information believed to be reliable, it is only a guide to effective working procedures and practices for this product. It is the responsibility of the purchaser to evaluate and determine its optimum use within their manufacturing environment. The uses or recommendations described herein should not be construed as permission to violate any patent or as a warranty of non-infringement of any patent.

