Green Banana Powder by DSI

A New Upcycled, Low Glycemic Index find

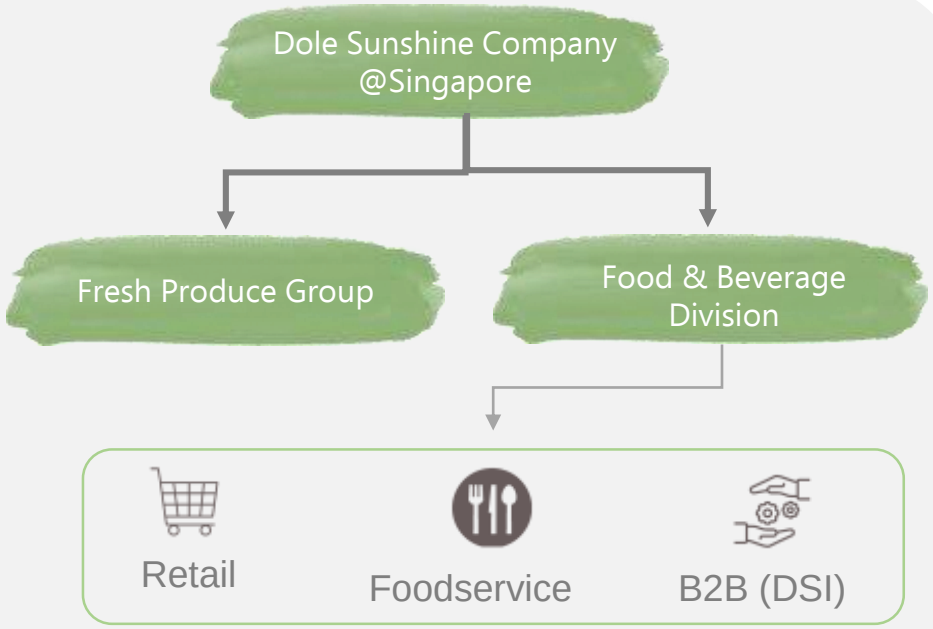
Natural Ingredient

Native Starch

About Dole

One of the world largest fruit players, committed to better planet, people and business

Company Structure



Dole as a Company

The foundations of Dole were laid in **1851**
TOP 3 in fruit producer the world

Exporting to more than **>70 countries**

Over **50,000 Hectares of farms** and more than **5 manufacturing facilities** and **400 fresh produce packing facility** and co-manufacturing partners

Dole Promises to zero fruit loss, zero processed sugar, carbon neutral , zero plastic, etc.

Who is DSI?

DSI is a **B2B Business Unit**, specializing in high value **Natural Ingredients** for F&B, Nutraceutical, Cosmeceutical, Textile and other Industries

- ✓ Upcycling fruit side streams
- ✓ Carbon neutral operation with green technology
- ✓ Ensure sustainable economy for communities (e.g. farmers)

Problems Associated with High Sugar Diets

1

Increased risk of cardiovascular disease

A diet consisting of foods high in sugar that have a high glycemic index (GI) can increase the risk of developing ***coronary heart disease (CHD)***

People who got **17% to 21%** of their calories from added sugar had a **38%** higher risk of dying from cardiovascular disease

2

Rapid Increase in blood sugar levels

Eating high GI foods can trigger the pancreas to release more insulin and then quickly fall. This promotes ***cravings*** and ***overeating***

The repeated consumption of high GI foods leads to ***weight gain*** and ***insulin resistance*** and factors associated with ***type 2 diabetes***

3

Fatty liver disease

Dietary carbohydrates are converted into fat which may turn into ***fatty liver disease***. Other affects include ***increased blood pressure*** and ***chronic inflammation***

Sugar overconsumption leads to changes in ***neurobiological brain function*** which can also alter emotional states and subsequent behaviors in individuals

Health Implications of High GI and Added Sugars in diet

Consumption of A***dded Sugars and High Glycemic Index (GI)*** foods

Chances of developing C***ardiometabolic Pathogenesis***

What is ***Cardiometabolic Pathogenesis***?
Cardiometabolic pathogenesis represents a cluster of metabolic abnormalities (mentioned below) that are risk factors for developing cardiovascular disease

Altered ***Artery Structure***

Hypoxia, pulmonary hypertension

Increase in ***Systolic and Diastolic pressure***

Increase in ***Triglycerides, Glucose Levels and Insulin Sensitivity***

Central Adiposity and increase in ***Peripheral Adipose Tissue*** at pubertal age

*Source of Information is Existing Literature

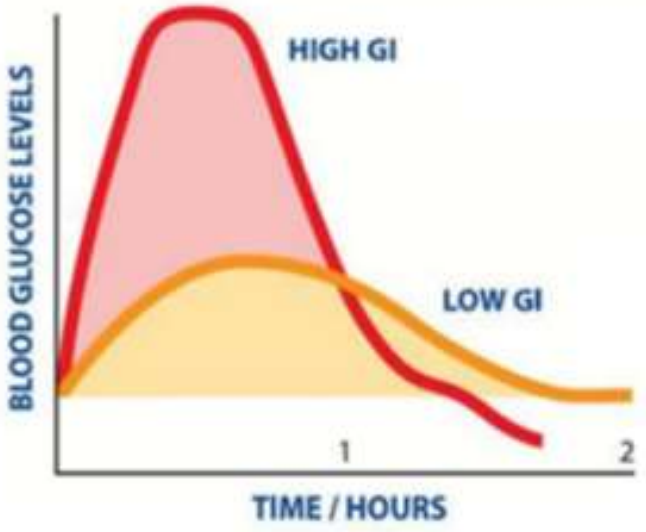
But what is Glycemic Index (GI)?

Glycemic Index (GI) compares the effect of a food on ***blood glucose levels*** to that of pure glucose

This index was designed as a measure to assess the ***blood glucose raising potential*** of the available carbohydrate foods

Blood glucose concentrations are measured before and after eating and changes are plotted as a curve (such as the one on the right)

Factors, such as variety, processing and cooking, influence the GI of food so even ***same foods can have a different glycemic index***



Key Takeaway:
Foods with ***a low glycemic index help*** to avoid chronic medical conditions such as coronary heart disease and diabetes mellitus amongst several others.

How does consuming foods with low GI help?

1

Beneficial for Diabetes Control

Foods with a lower glycemic index can reduce the risk of developing type 2 diabetes

2

Cardiovascular Disease

Consumption of foods with lower glycemic index assist with reduction in cardiovascular diseases

3

Controls Obesity

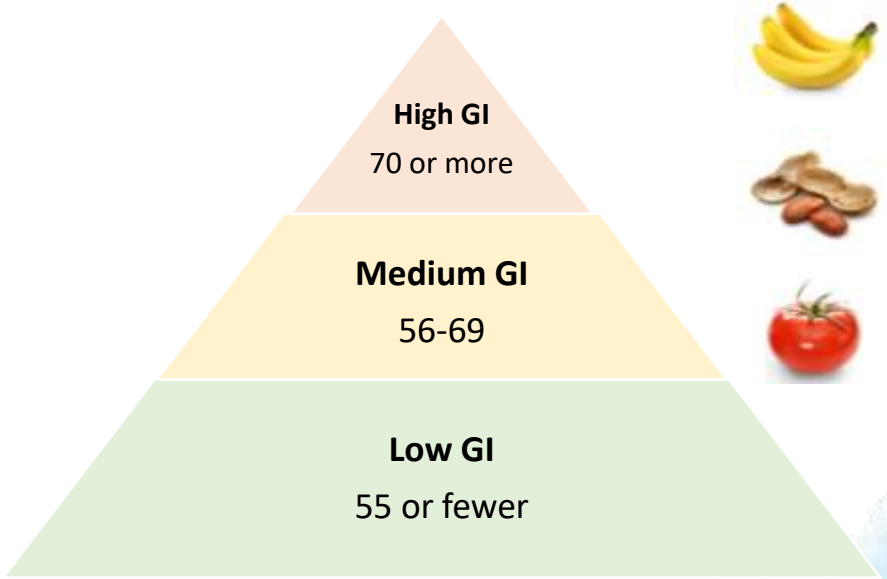
Low GI foods facilitate greater weight loss. Low GI foods help burn more body fat and less muscle

4

Moderate to weak association for prevention of certain types of cancers

Low GI foods produce lower post-prandial glucose and insulin responses and have been associated with lower breast cancer risk

Glycemic Index Ranges



High GI Foods

White bread, white rice, taco shells, spaghetti, chocolates, popcorn, etc

Medium GI Foods

Mango, Banana, Cous Cous, Corn, Brown rice, Boiled Sweet Potatoes

Low GI Foods

Meats, grains and starches, fruits, milk alternatives & other beverages

*Source of Information is Existing Literature

What is Green Banana Powder (GBP)?

How is GBP made?

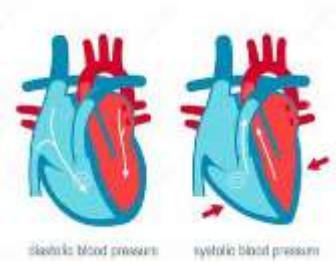
GBP is made from ***unripe green banana*** that are collected and processed at Dole's processing facilities

Constituents of GBP

GBP is naturally rich in ***resistance starch*** which aids in better ***gut health*** and improved maintenance of digestive system

Potential uses

Due to its ***nutritional*** and ***functional*** benefits it can be used in bakery, beverages and health supplement application. GBP can also be used in several gluten free applications such as muffins, breads etc. (other food and beverage applications)



Key Market Developments

- Green Banana Flour (GBF) market has witnessed several established firms and new companies entering the market, driven by increasing demand for the product.
- GBF's ***gluten free nature*** and it's ability to prevent and alleviate symptoms of several diseases (such as blood ***pressure, asthma and diabetes***) are the key factors driving the market growth
- GBF is being actively used as a key ingredient by multiple F&B processors to keep up with consumer demand for ***clean label and natural ingredients***
- Apart from the health benefits products labelled as ***clean label*** are marketed as ***vegan, gluten free, low in calories, high in resistant starch and prebiotics***

Green Banana Powder: as a good alternative

Green banana is naturally rich in Resistant Starch and is also rich in minerals such as Potassium and Magnesium

- No Banana Flavor
- Low Sugar Content
- Vegan

Shelf Life & Storage

Shelf Life	18 ~ 24 months from manufacturing date
Storage	Cool dry place, between 10 – 25 ℃
Packaging	Thermo-sealed high aluminium laminated pouch

Physical & Chemical Properties

Total Starch	>60%
Resistant Starch	>35%
Dietary Fiber	>5%
Potassium	NMT 15000 ppm
Magnesium	NMT 750 ppm
Moisture content	<5%

Liquid Holding Capacity

Water	1.35g/g
Oil	1.56ml/g

Sensory Information

Colour	Light yellow/white/cream
Appearance	Free flowing powder

Superfood, Green Banana Powder

Known as a powerful prebiotic fiber, resistant starch works through the digestive system to promote a healthier gut

Stabilization of blood sugar

Improve your body's natural ability to manage blood sugar and insulin sensitivity

Weight loss

Allows the body to stay full for a more extended period due to high levels of resistant starch

Regulates Digestion

Promotes healthy digestive process and improve bowel movement

Diabetes Control

Improves metabolic control and long-term blood sugar management

How does GBP Work?

1 Resistant Starch Fills Your Stomach

Feeds the good bacteria in your gut while avoiding glucose spike.

2 Alters Gut Microbiome

Strengthens the gut and naturally creates butyrate that helps to protect your brain and prevent diseases like, Alzheimer's disease.

3 Boosts Metabolism

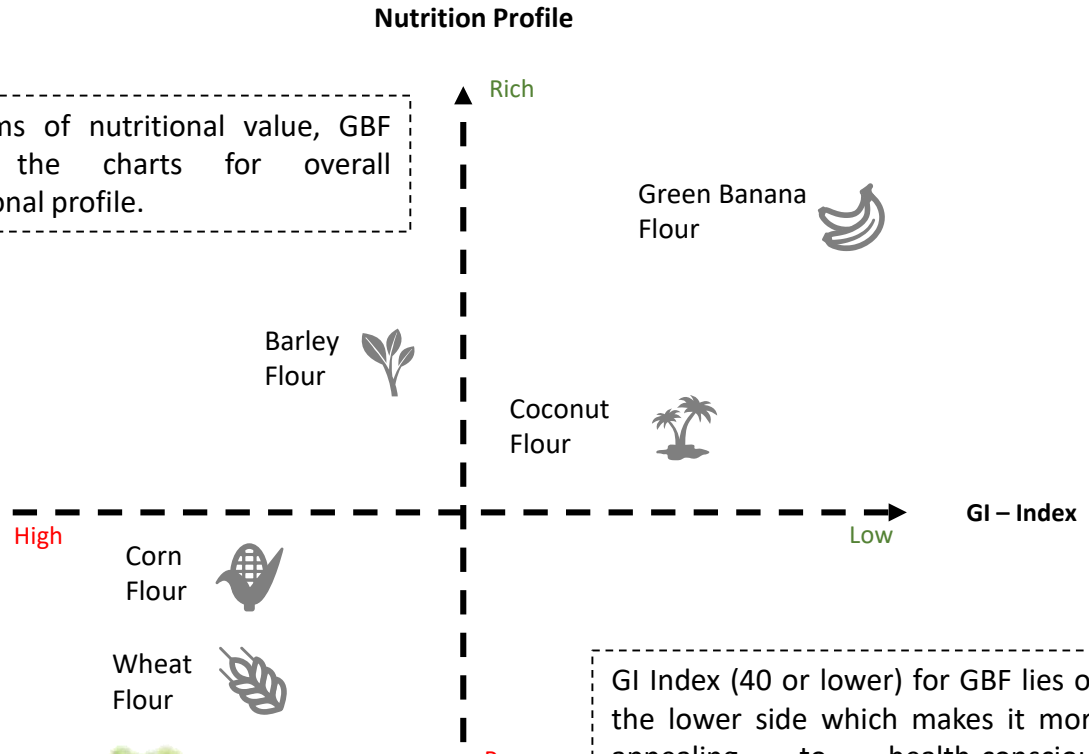
Regulates insulin response, appetite, inflammation, immune response, sleep, and more.

*Source of Information is Existing Literature

GBP Nutritional Profile and benefits

Utility and Nutritional Profile

In terms of nutritional value, GBF leads the charts for overall nutritional profile.



GI Index (40 or lower) for GBF lies on the lower side which makes it more appealing to health-conscious consumers

Health Benefits v/s concerns

GBP - Health benefits outweigh (high RS, low GI, prebiotic, gluten-free) the potential health concern (bloating)

Coconut Flour - Smarter flour choice due to higher fiber and protein intake, with potential bloating being the only concern

Barley Flour - Low cholesterol levels and weight management make it a decent flour choice for consumers

Corn Flour - Health concerns (high sugar levels and impaired cardiac health) overpower the low nutrient profile.

Wheat Flour -Health concerns (high sugar and cholesterol levels) overpower the low nutrient profile.

Clinical Trial by DSI - Glycemic Response of GBP, Psyllium Husk & Maltodextrin

Goal of the study

A clinical trial was conducted to determine the Glycemic Response (GR) of Green Banana Powder, Psyllium Husk and Maltodextrin

GR refers to the changes that happen in blood glucose after consumption of a carbohydrate-containing food which can only be measured by conducting in-vivo testing

What is In-Vivo Testing

In-vivo testing involves the use of human subjects. Testing is conducted within the living organisms as opposed to outside

Subject Selection – Inclusion Criteria

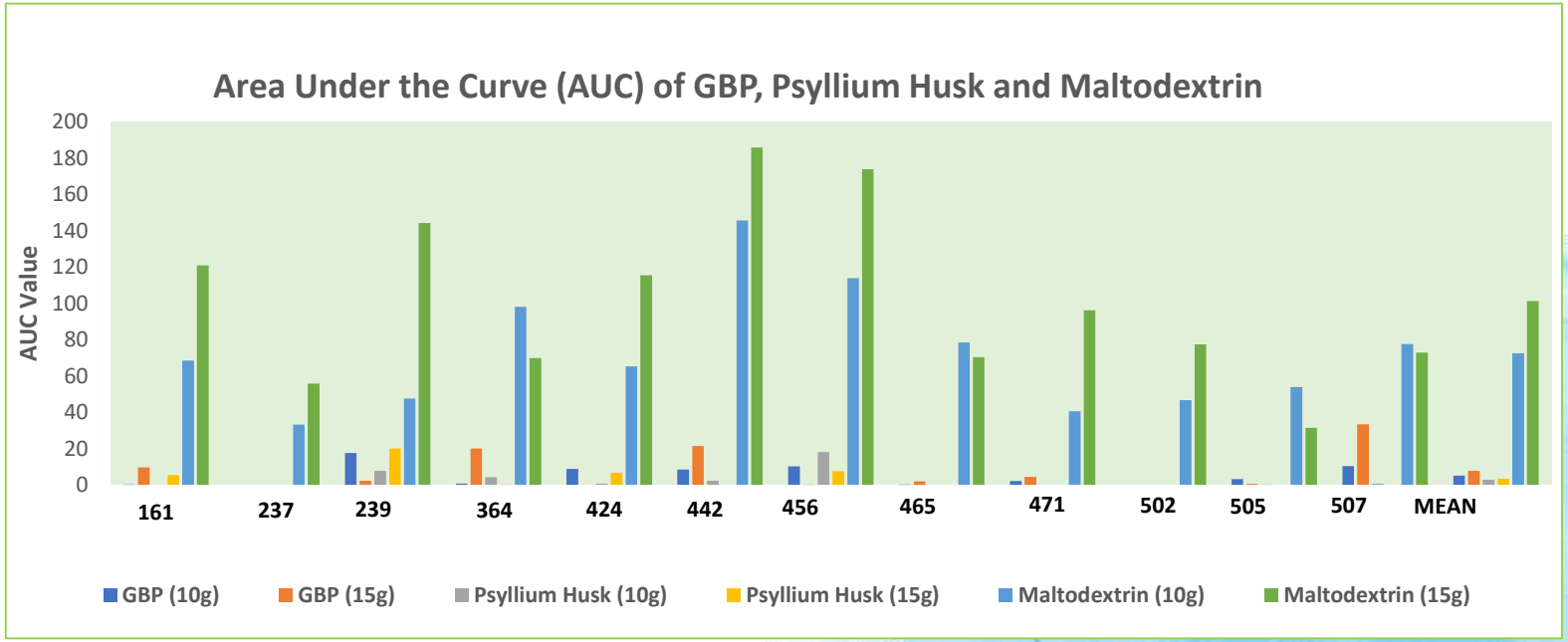
- Subjects must be healthy males or non-pregnant females at least 6 weeks post delivery, non-lactating and age 19-60 years old
- They should not suffer from any chronic diseases
- They shouldn’t have any food allergy or intolerance
- They shouldn’t consume any medications known to affect glucose tolerance

Research findings on the Glycemic Index of GBP, PH and Maltodextrin

DSI conducted a study to compare the ***Glycemic Responses (GR)*** of Green Banana Powder, Psyllium Husk and Maltodextrin.

The subjects for the study were healthy males or non-pregnant females with a ***BMI of 18.5 to < 25kg/m2.***

The graph below demonstrates the average ***120 minutes glycemic response*** curves for equal servings of GBP, PH & Maltodextrin.

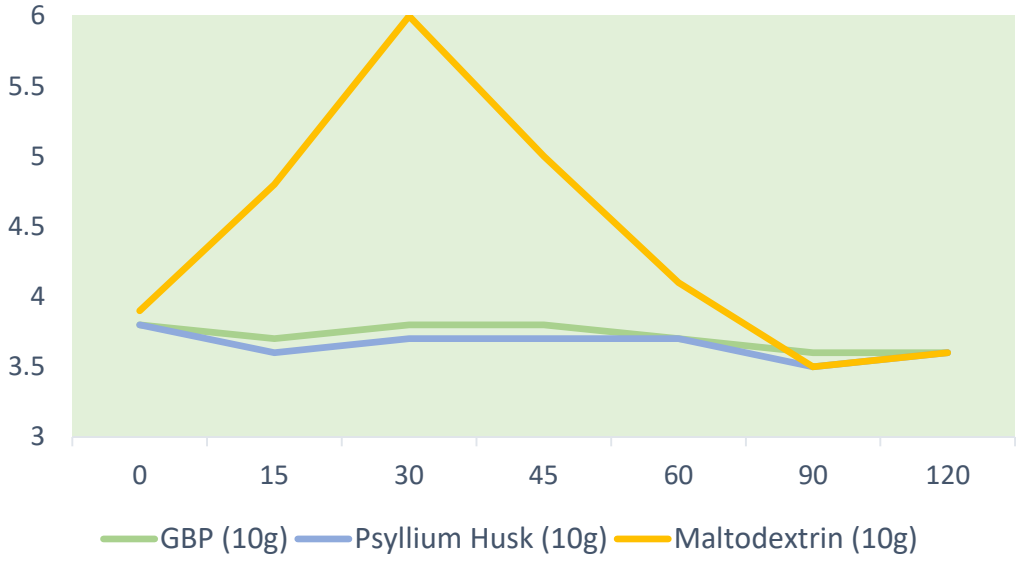


Findings

- The results demonstrate that GBP (orange bars) and Psyllium husk have ***significantly lower*** glycemic responses compared to Maltodextrin
- At both dosage levels, 10g and 15g, these results hold true, validating the hypothesis that ***GBP is in fact a low GI find***

Summary Findings and Glycemic Response Curves

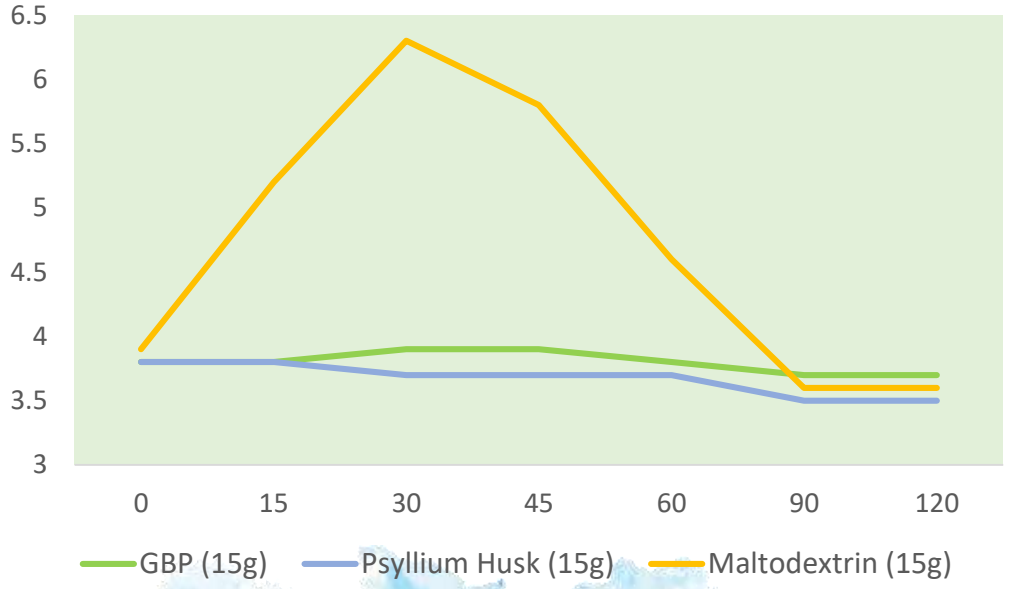
Average Glycemic Response Curves between GBP (10g), Psyllium Husk (10g) and Maltodextrin (10g)



Findings

- GBP produced ***93% lower glycemic response*** compared to Maltodextrin, while psyllium husk produced ***96% lower glycemic response*** compared to Maltodextrin

Average Glycemic Response Curves between GBP (15g), Psyllium Husk (15g) and Maltodextrin (15g)



Findings

- GBP produced ***92% lower glycemic response*** compared to Maltodextrin, while psyllium husk produced ***97% lower glycemic response*** compared to Maltodextrin.

Potential Market Segments & Applications

Green Banana Powder (GBP) can be consumed in ***several formats***

1 An ideal ingredient for ***Baking Premixes*** since it can be used as a ***binding & thickening*** agent

2 Easy to ***blend*** into ***smoothies*** and can be mixed with ***shakes***

4 Conveniently add it to ***snack or energy bars*** that need not be baked

3 Sprinkle it on top of your ***oatmeal or cereal***

5 Can be consumed with ***powdered supplements***

An Ideal, Healthy Ingredient for Baking

Healthy gluten free flours are gaining widespread popularity amongst developed nations such as Europe and North America

Examples of already Marketed Products

Retail packaging sold ***in Australia***
Price Range **-** $50 - $62.5

Retail packaging sold ***in USA***
Price Range - $70 - $75

Retail packaging sold ***in Europe***
Price range - $87.5 - $92

Drivers of growth in Gluten free flours

Growing Need for *Healthier Alternatives*

- Ideal for those suffering from ***celiac disease or are gluten intolerant***
- The ***connection*** between diet and health is growing stronger within consumers

Specific *nutritional benefits*

- High in ***potassium and magnesium***
- Feel more satiated
- Improved digestive health
- No ***artificial colors or flavors***
- Energy management
- Reduced Glycemic Response

- These are not actual DSI customers and are demonstrative examples
- Reference pricing is given in $/kg for ease of reference

Healthy Premix Segment

Gluten-Free Bakery Premix Market and Sellers of Baking Kits

F&B product developers are focusing on developing gluten-free premixes as they are perceived to be a healthier

Examples of already Marketed Products

Retail Packaging sold in the ***USA and Canada***
Price Range $9 - $10 (300g)

Retail Packaging sold ***in India***
Price Range $ 8 - $9 (250g)

Drivers of growth in the Premix Segment

Rising ***consumer inclination*** toward RTU F&B

Consumers have developed a ***strong inclination towards RTU*** due to ease of convenience.

The F&B premixes market is forecast to grow at a ***7% CAGR during 2022-2027***

Standardized Product

Product ***consistency***

Lower chances of incorrectly measuring raw materials

Reduced labour and low inventory costs are also contributing to the rising consumer preference

Direct Consumption Sachets

GBP in ***sachet or individual consumption format*** can be added to a wide range of food products

Examples of already Marketed Products

Retail Packaging sold ***in Japan***
Price Range ***$6 - $7*** (50g)

Drivers of growth in the direct consumption Segment

Resistant starch that reaches deep into the large intestine

Super dietary fiber made from 100% natural green bananas which makes the ***intestinal activity*** a habit

Cold Soups

The effect is improved by taking it with potato and legume soup containing a lot of starch

Yogurt and Intake

Excellent compatibility between GBP and good bacteria such as lactic acid bacteria and bifidobacteria

Smoothies and Ingestion

Adjust your body's clock with morning intake. Just put it on the mixer, so it's easy even on a busy morning

*The price has been taken from an online platform (subject to change)
*Source of information is existing literature and products shown are Non-DSI

Why GBP is value for Money

Low GI Products – Why invest in purchasing GBP?

Low glycaemic index (GI) products are generally positioned in the premium segment compared to their traditional/conventional counterparts due to multiple reasons such as lower health risks, health benefits, cleaner product profile, etc.

Nutritional Profile

Low GI food products offer an ***enhanced nutritional profile*** compared to the conventional products such as nutrient fortification, higher protein content, lower sugar levels, etc.

Difficult Sourcing

Use of functional natural ingredients also require adequate supply and presence of a ***strong supply chain*** – some of these ingredients are produced in niche regions with limited supply making it a difficult commodity to source

Addition of Functional Ingredients

Generally, end-use F&B products claiming a lower GI tend to have ***artificial sweeteners and/or functional ingredients*** which increase the overall production cost

A premium Manufacturing Process

Achieving a ***healthier nutritional profile*** along with retention of taste & texture requires use of specialised ***machinery and technology*** – conventional methods can hamper the nutrient balance

Source: Publicly Available Data

Summary

Work alongside ***Dole Specialty Ingredients*** to create ***Upcycled ingredients*** that are good for people, the planet and prosperity – triple good “Sampo Yoshi”

Our Promises

Natural, sustainable and cruelty-free
100% from Dole’s Green Banana

Upcycling fruit side streams
We use 100% upcycled tropical fruit streams from agriculture and manufacturing operations

Green technologies
To ensure our processes are eco-friendly without impacting earth’s resources

Going carbon neutral
Reducing carbon footprints as our production factory is located right at the farms

Traceability back to plantations
Ensuring food safety, operational efficiency and end consumer sustainability demands

Ensuring sustainable economies for farmers
We create economic opportunities for our farmers and ensure safe work environments