SAMYANG

Fiberest® Resistant Dextrin

Nutrition Information Datasheet

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Fiberest® Resistant dextrin

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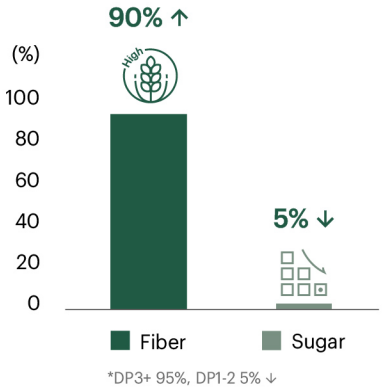
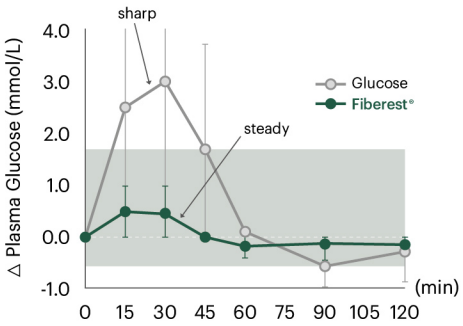
01 Characteristics

High fiber content while low sugar content



*DP3+ 95%, DP1-2 5% ↓

Lower blood glucose curve



* Glycemic response research report SUGiRS (2023)

The best soluble fiber by adding texture, stability, and nutrition

- ✓ Masks off-taste and off-flavor
- ✓ Enhances texture
  - softness and crispiness
- ✓ Maintains stable physicochemical properties
  - avoiding caking, precipitation, and water separation

02 Product lineup

	Fiberest® Resistant Dextrin HF	Fiberest® Resistant Dextrin GF	Fiberest® Resistant Dextrin LS
Type	Powder	Powder	Syrup
Raw material	N-GMO Corn	N-GMO Corn	N-GMO Corn
Dry Solids (g/100g, %) (AOAC 941.14)	Over 95	Over 95	Over 70
Dietary fiber (dry solids, %) (AOAC 2001.03)	Over 90	Over 70	Over 90
Sugars (wt/wt, %) (AOAC 977.20)	Max 5	Max 5	Max 5

03 Health functionalities

1. Enhances the growth of probiotics (*e.g. Lactobacillus spp., A.muciniphila*)
2. Increases the amounts of positive metabolites (e.g. SCFAs)
3. Inhibits the adherence of pathogenic bacteria to the colonic epithelial cells
4. Alleviates constipation symptoms
5. Improves serum triglyceride levels

04 Application

Certifications

FSSC 22000 · HALAL · NON GMO Project VERIFIED · HACCP · ISO · GMP

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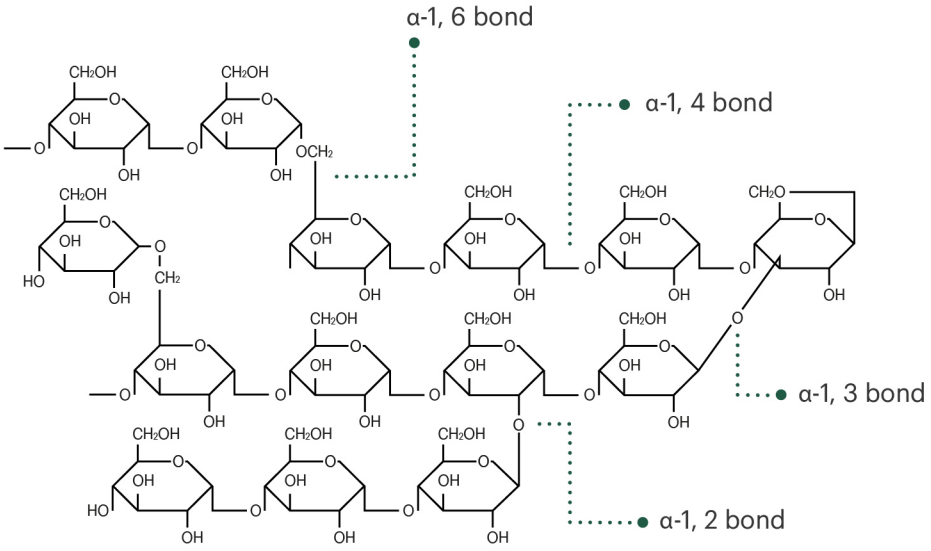
Fiberest®

1 Overall Status

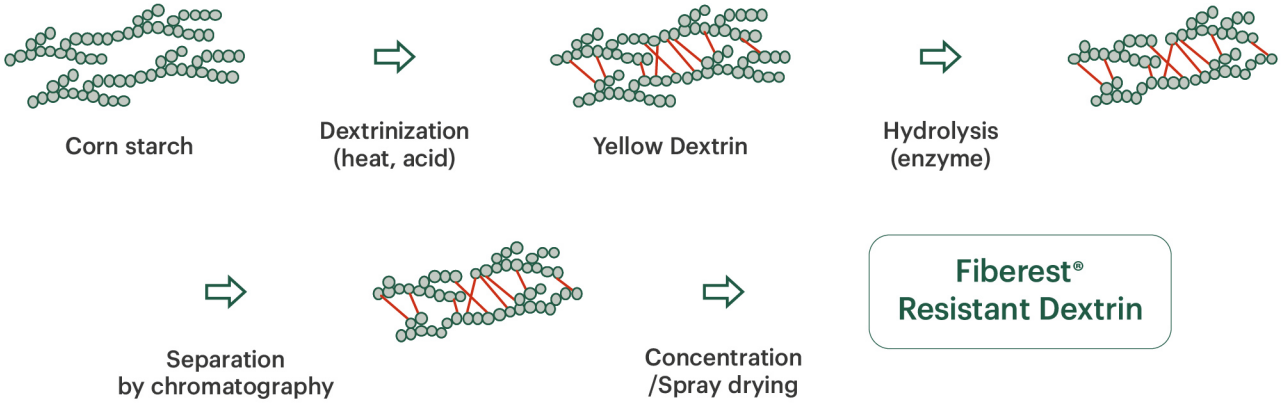
1) Fiberest® Resistant Dextrin

'Fiberest® Resistant Dextrin HF/GF/LS' is obtained by fractionating indigestible components after enzymatic reaction with roasted corn starch. Resistant dextrin is resistant to hydrolysis by the human digestive system. It is permitted for use as a dietary fiber in various countries and is used as a food ingredient. With certain amount of resistant dextrin added, 'High in fiber' or 'Good source of fiber' can be claimed on the package of final products. It also works well as a bulking agent in 'Reduced/Low/No Sugar' products.

Chemical structure of resistant dextrin



Simple manufacturing process of Fiberest® Resistant Dextrin



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Fiberest®

1 Overall Status

2) Product Lineup

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Certifications

FSSC 22000 · HALAL · NON GMO Project VERIFIED nongmoproject.org · HACCP MFDS · ISO 14001 · ISO 9001

3) Regulatory Status

- Generally Recognized as Safe in compliance with US FDA regulation 21CFR184.1444
- Classified as dietary fiber under COMMISSION DIRECTIVE 2008/100/EC ANNEX II in EU

4) Labeling

- “Indigestible dextrin”, “Indigestible maltodextrin”, “Resistant dextrin”, “Resistant maltodextrin”, “ Soluble corn fiber”, “Soluble maize fiber”

* Labelling for resistant dextrin may vary from country to country. Please contact Samyang for further information.

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Fiberest®

1 Overall Status

5) Nutritional Information

(Per 100g product)

Nutrient	Fiberest® Resistant Dextrin HF	Fiberest® Resistant Dextrin GF	Fiberest® Resistant Dextrin LS
Total Calories	200 kcal	243.6 kcal	158.4 kcal
Calories from Fat	0 kcal	0 kcal	0 kcal
Total Fat	0 g	0 g	0 g
Saturated Fat	0 g	0 g	0 g
Trans Fat	0 g	0 g	0 g
Cholesterol	0 g	0 g	0 g
Sodium	0 g	0 g	0 g
Total Carbohydrate	95 g	95.9 g	72 g
Total Sugars	5 g	4.4 g	0 g
Added Sugars	0 g	0 g	0 g
Dietary Fiber	90 g	70 g	64.8 g
Other Carbohydrate	0 g	0 g	0 g
Protein	0 g	0 g	0 g
Calcium (Ca)	0 g	0 g	0 g
Sodium (Na)	0 g	0 g	0 g
Iron (Fe)	0 g	0 g	0 g
Potassium	0 g	0 g	0 g
Ash	0.1 g	0.1 g	0.1 g
Vitamin A (as retinol)	0 g	0 g	0 g
Vitamin C	0 g	0 g	0 g
Vitamin D	0 g	0 g	0 g

* According to FDA's regulations in 21 CFR 101.9, the caloric value of soluble non-digestible carbohydrate is 2kcal/g, and other carbohydrates is 4 kcal/g.

** Nutrients marked with 0 indicate that they are not the main source of the product

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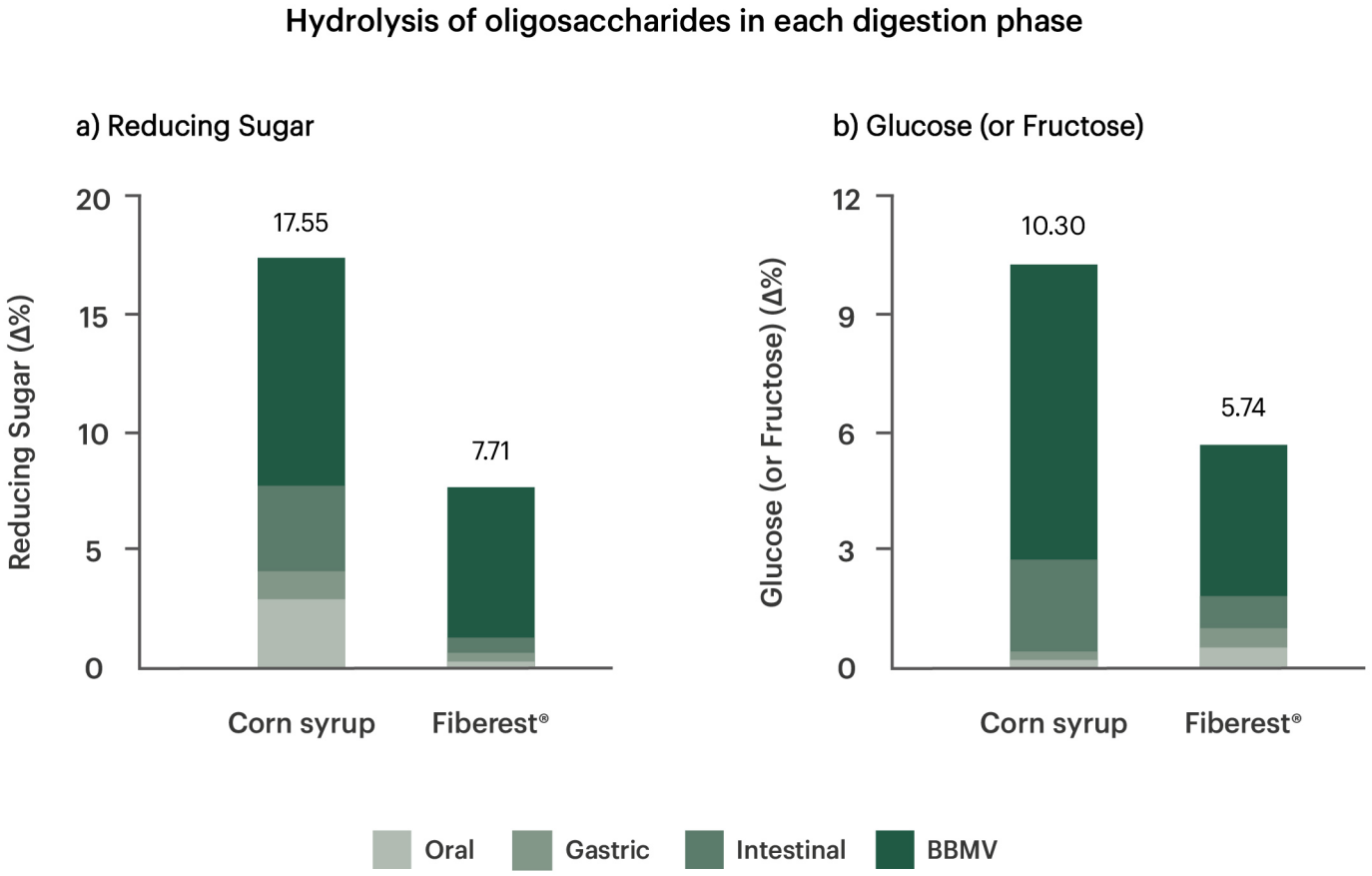
2 Low Digestion Rate

Fiberest® Resistant Dextrin resists digestion in the small intestine. The digestibility of Fiberest® Resistant Dextrin was measured using *in vitro* digestion system describing four digestive (oral, gastric, intestinal, BBMV*) phases. After hydrolysis, the reducing sugar and glucose contents for Fiberest® Resistant Dextrin were 7.71% and 5.74% respectively compared to 17.55% and 10.30% for corn syrup.



*** BBMV**

Brush Border Membrane Vesicle, an enzyme complex isolated from human intestinal epithelial cells that can cleavage α(1→4) and α(1→6) bond

Cheon, Seongwon et al. "Comparative Analysis of Prebiotic Effects of Four Oligosaccharides Using in Vitro Gut Model : Digestibility, Microbiome, and Metabolome Changes." *FEMS Microbiology Ecology* 99, no. 2 (2023): fiad002. https://doi.org/10.1093/femsec/fiad002.

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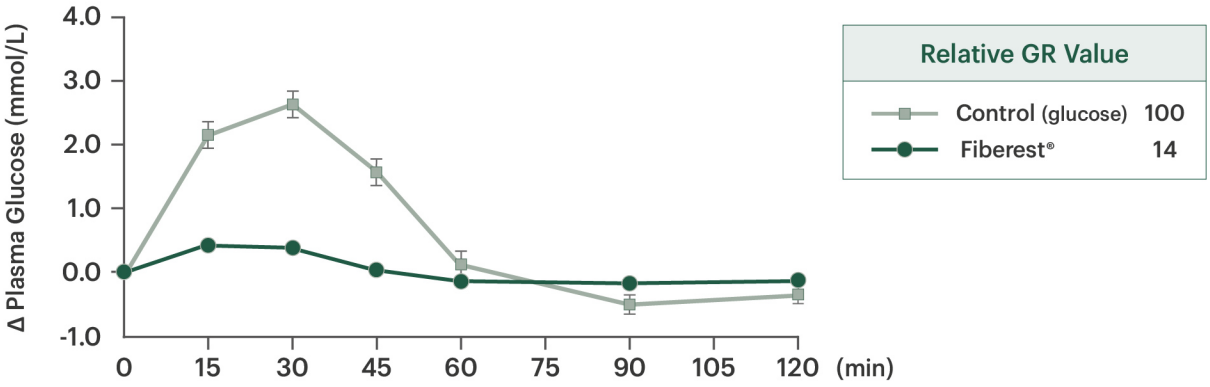
3 Low Glycemic Response

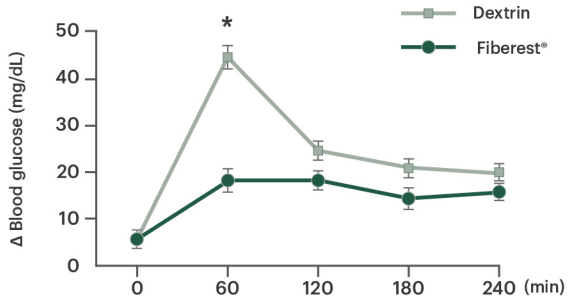
Fiberest® Resistant Dextrin has a low glycemic response. The relative postprandial glycemic response (GR) value was measured using the modified method of ISO 26642:2010. In humans (n=10), the GR value is measured after consuming 25g each product/day. For Fiberest® Resistant Dextrin, the GR value is about 14, compared to 100 for control (glucose).

The average plasma glucose response curves for Fiberest® and glucose

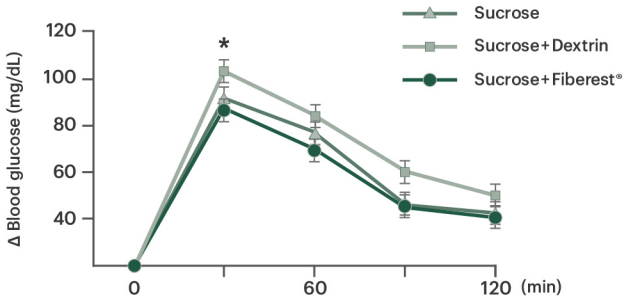


Oral sucrose tolerance test (OSTT) is performed in Sprague-Dawley (SD) rats. After 30 minutes of consumption of the test materials with sucrose, consuming Fiberest® resulted in a lower increase in blood glucose compared to consuming dextrin. Since Fiberest® Resistant Dextrin is rarely hydrolyzed, there is no additional increment of blood glucose.

Changes in blood glucose levels after dextrin or Fiberest® intake



Changes in blood glucose levels after dextrin or Fiberest® intake with sucrose



* : Significantly different between 'Dextrin' and 'Fiberest®', p<0.05

A Study on the Liver Protection Effect of Resistant Maltodextrin (BLFR-I14029). National Center of Efficacy Evaluation for the Development of Health Products Targeting Digestive Disorders (NCEED), 2016

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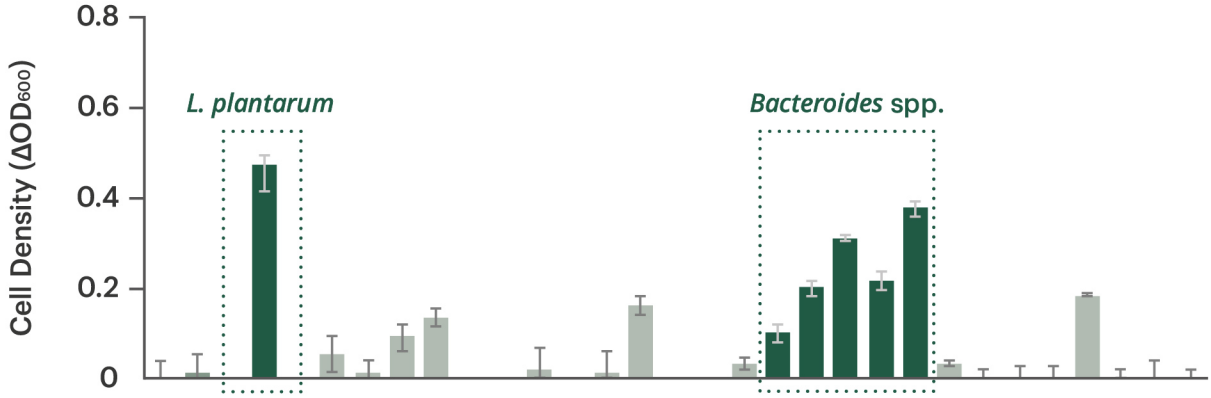
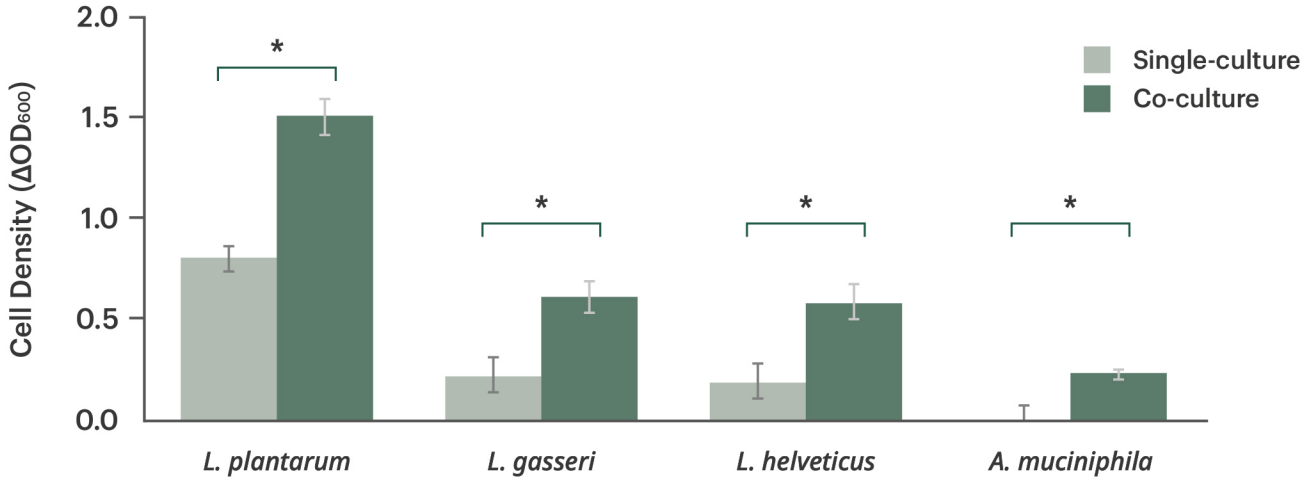
4 Prebiotic Effects

There are interaction and cross-feeding effects between intestinal bacteria. To investigate the cross-feeding effects of bacteria, *in vitro* co-cultivation test was conducted. As a result of co-culture with *B. xylanisolvens* in the medium containing Fiberest® Resistant Dextrin, the growth of four probiotic strains (*L. plantarum, L. gasseri, L. helveticus, and A. muciniphila*), which were barely grown in single-culture, showed significantly increased growth.

Single-culture in Fiberest®-containing medium for 31 types of intestinal bacteria



Differences in cell growth between single- and co-culture



* : Significantly different between 'Single-culture' and 'Co-culture', p<0.05

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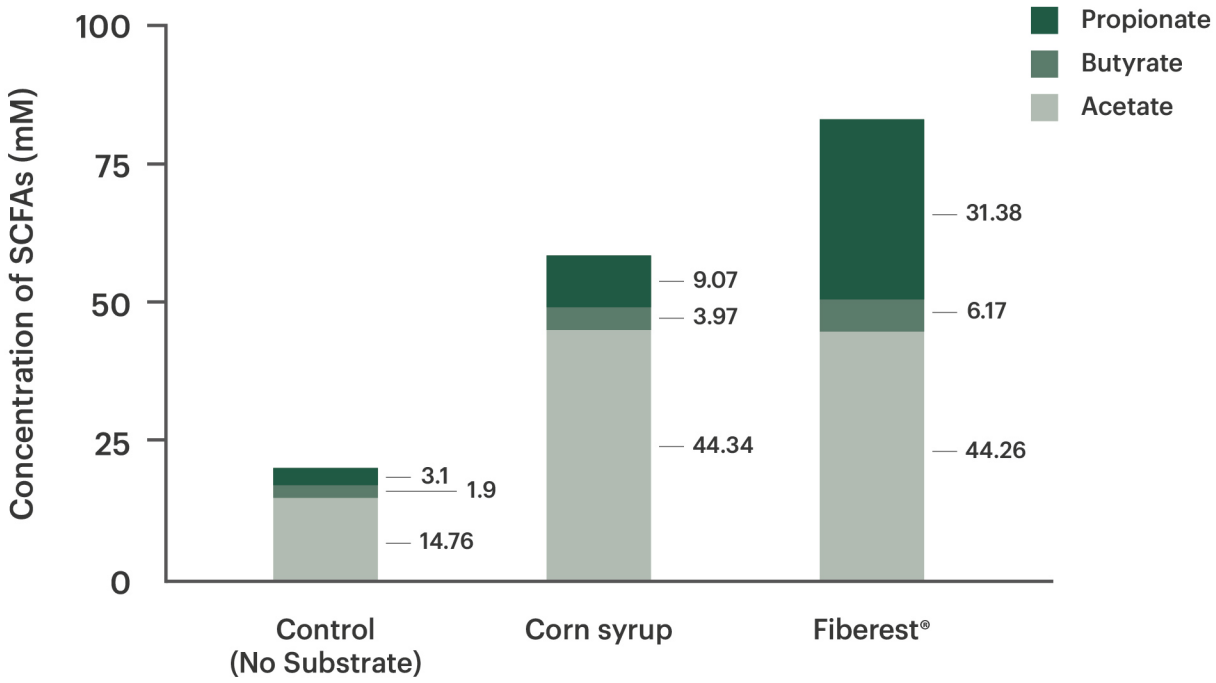
5 Gut Health - SCFAs

Fiberest® Resistant Dextrin increases the short-chain fatty acids (SCFAs). In the *in vitro* fecal fermentation test, SCFAs (acetate, propionate, and butyrate) increased compared to the control group. Especially, propionate and butyrate significantly increased after the fermentation of Fiberest® for 24 hours.
Propionate have a role to control weight of body and blood glucose levels with the effect of inhibiting lipogenesis in the liver and inhibits appetite hormones through FFAR2 receptor stimulation.
In addition, Butyrate affects anti-inflammatory and immune-related pathways and has the effect of suppressing obesity by increasing lipolysis in white adipose tissue. Therefore, the fermentation of Fiberest® by gut microbiota leads to an increase in the amount of SFCAs, resulting in positive health effects.

Changes in 3 types of short-chain fatty acids (SCFAs) after *in vitro* fecal fermentation



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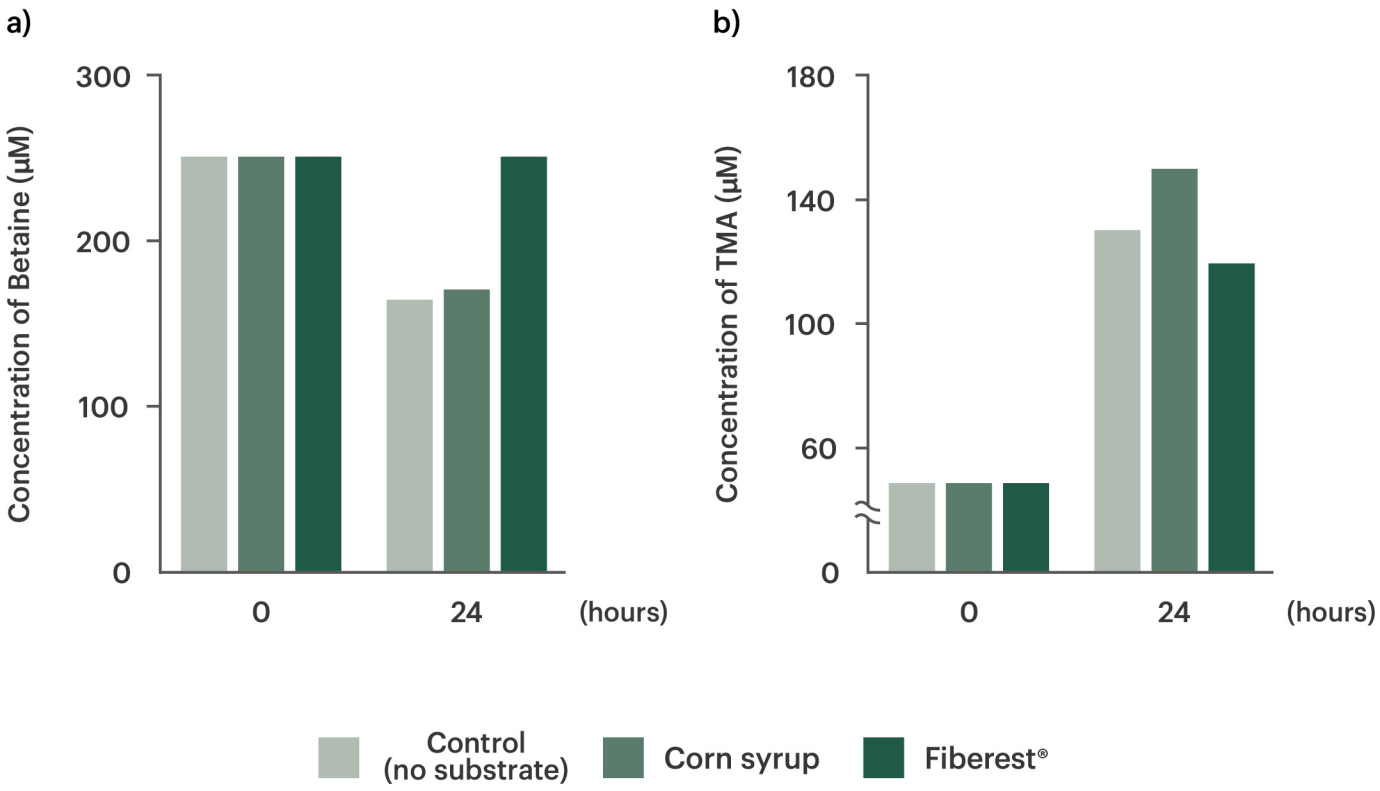
5 Gut Health - Other Gut Metabolites

Fiberest® Resistant Dextrin affects the low conversion of gut metabolites related to cardiovascular disease. In the *in vitro* fecal fermentation test, the concentration of betaine was maintained after the fermentation for 24 hours, and also the concentration of trimethylamine (TMA) showed only less increase compared to the control group. Betaine is converted to TMA by gut microbiota, mainly Firmicutes, Proteobacteria, and Actinobacteria, but not Bacteroidetes. In the body, TMA is absorbed, moved to the liver, and oxidized to trimethylamine N-oxide (TMAO) related to cardiovascular disease. Fiberest® Resistant Dextrin increases the abundance of *Bacteroides* spp. (belong to the Bacteroidetes phylum), so it can inhibit the conversion of betaine to TMA.

Changes in the concentration of a) betaine and b) trimethylamine after *in vitro* fecal fermentation



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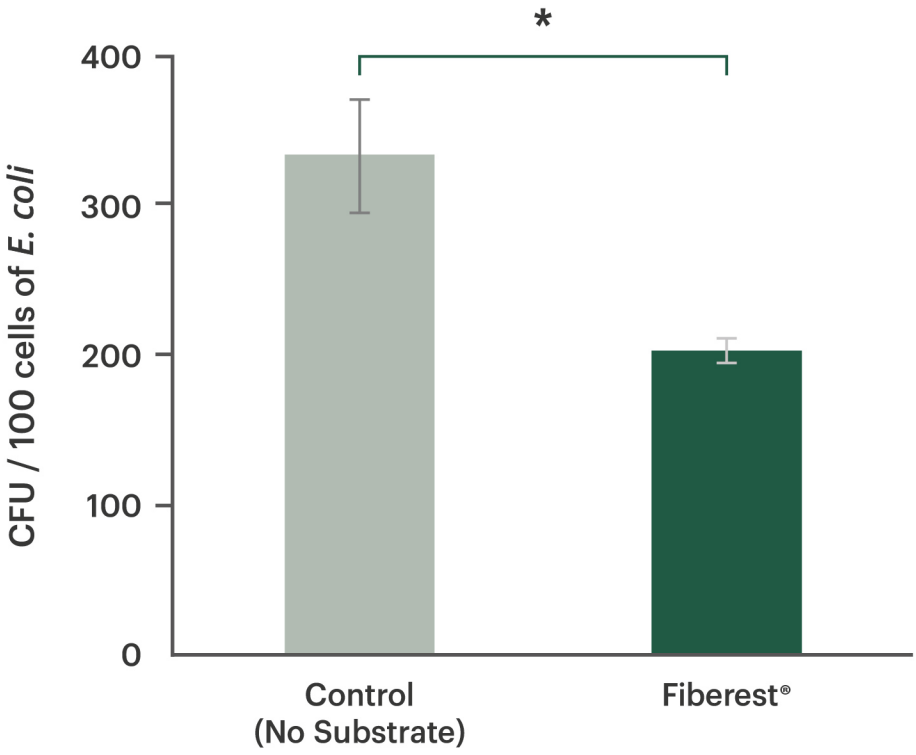
5 Gut Health - Inhibiting Pathogenic Bacteria

Fiberest® Resistant Dextrin has an inhibitory effect on the adhesion of pathogenic bacteria to intestinal epithelial cells. Adherence of *E. coli* was assessed in an *in vitro* test model using Caco-2 human epithelial cells. As a result, the adhesion rate decreased compared to the conrtol group.

Adherence inhibition of *E. coli* O157: H7 to Caco-2 cells in the presence of Fiberest®



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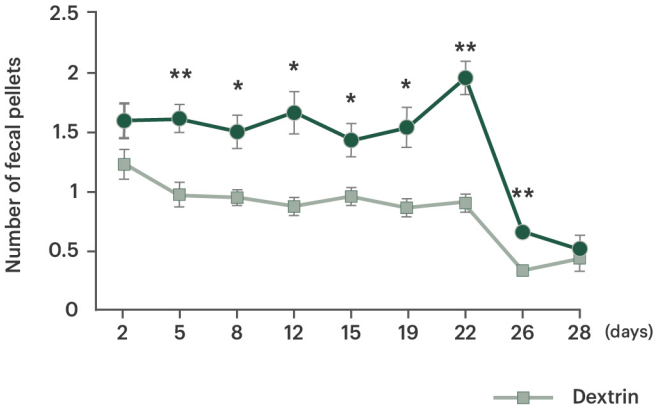
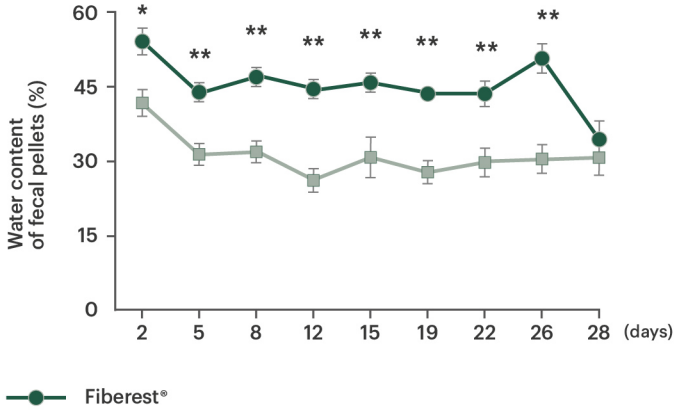
5 Gut Health - Improving Constipation

Fiberest® Resistant Dextrin alleviates constipation symptoms. To confirm the function of Fiberest® Resistant Dextrin to improve constipation and facilitate bowel movement, *ad libitum* feeding with Fiberest® Resistant Dextrin (or dextrin) was performed for 28 days using SD rats and Loperamide was administered on the 26th day to induce constipation. As a result, the ingestion of Fiberest® Resistant Dextrin improved constipation-related symptoms, intestinal environment and mucosal functions.

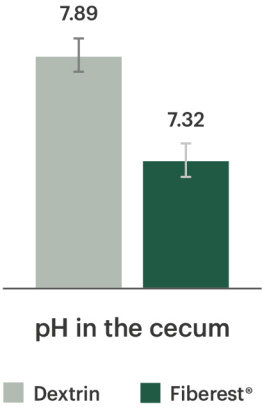
a) Increased fecal weight



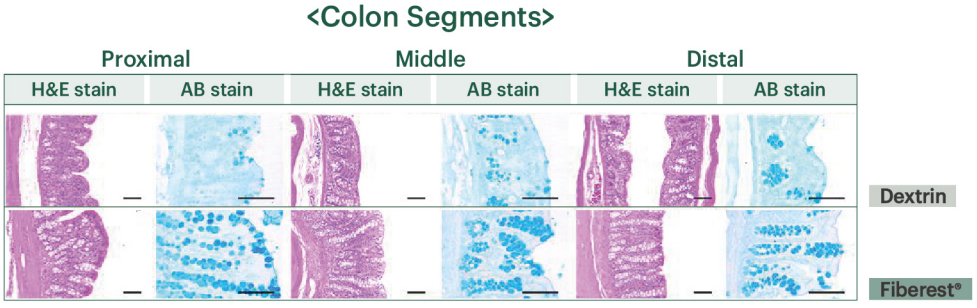
b) Increased water content of fecal pellets



c) Decreased pH in the cecum



d) Improved mucosal atrophy and mucosal cell reduction



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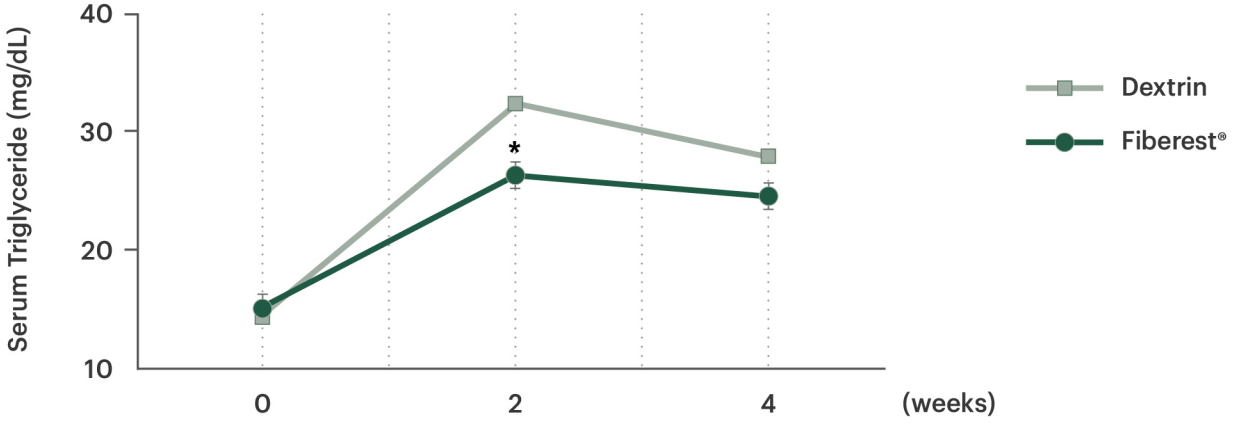
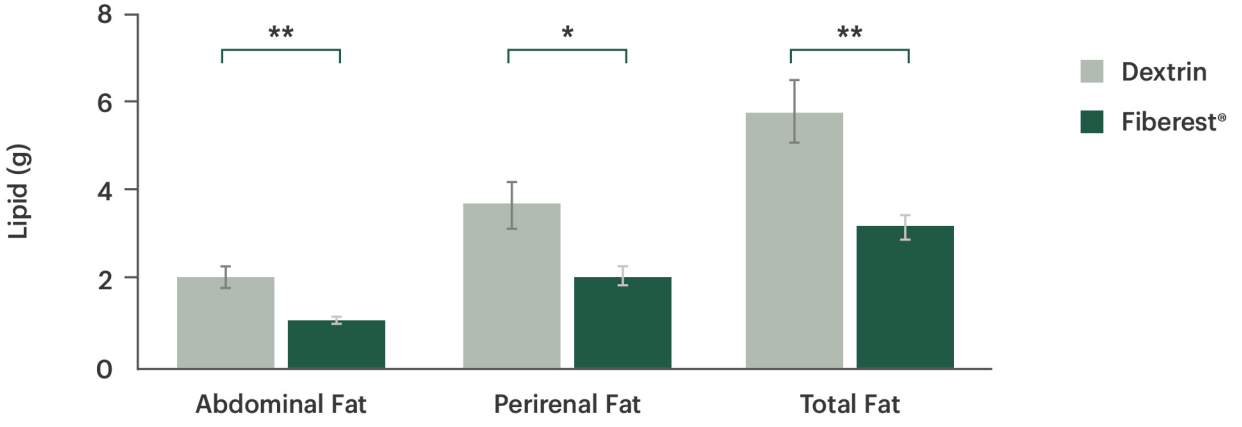
6 Improving Serum Triglyceride

Fiberest® Resistant Dextrin improves lipid profile. To confirm the effect of Fiberest® Resistant Dextrin on improving serum triglyceride (TG) levels, it was tested on the *in vivo* model (n=10) provided *ad libitum* feeding with 5% Fiberest® Resistant Dextrin added to a high-fat diet for 4 weeks. Compared to the dextrin as a control, Fiberest® Resistant Dextrin showed a decrease in TG concentration in plasma after 2 weeks of intake. In the same experimental model, when the visceral (perirenal) and abdominal fat contents were measured after 4 weeks, consuming Fiberest® showed a lower lipid weight in adipose tissues.

Effects of the Fiberest® for serum triglyceride level



Effects of the Fiberest® on the lipid weight



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