

BAGASSE

Fiber Extracted from Sugar Cane Grown in Okinawa

2006.6.9



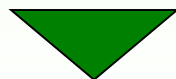
Ryukyu Bio-Resource Development Co.,Ltd

Introduction

The base material used in our product “BAGASSE” was developed as a project of Japan Science and Technology Agency (JST), an Independent Administrative Institute under the Ministry of Education, Culture, Sports, Science and Technology. The Agency invested the public funds allocated in the 2003 extraordinary budget in developing this material with a focus on the prevention of lifestyle-related diseases.

●Background of the Development

Until recently there has been no viable method to utilize Bagasse, which is a high fiber by-product obtained after squeezing sugar from sugar cane. The importance of Dietary fiber as an essential nutrient, combined with the increasing rate of lifestyle-related diseases caused by fiber deficiency, has increased public awareness and is now a serious social issue attracting many people's attention.



Therefore

With a focus on prevention of lifestyle-related diseases, “**Fermented Bagasse**” – a dietary fiber with high versatility, has been developed with JST's funds for new technology development projects.

●Commissioning

- Researchers on this technology·····Mr. Yutaka Kashiwagi from National Food Research Institute, Chief of Applied mycology Lab.
Mr. Seiji Ohara from Forestry and Forest Products Research Institute, Chief Department of Forest Chemistry.
- Commissioned Company for Technology Development·····Ryukyu Bio-Resource Development Co., Ltd

●Research on the safety for human consumption

- Research on the safety of this material when used for human consumption was conducted by Hibi Reimei Jyuku, a NPO which conducts research and investigation on supplements and other foods.

Supervisor: Honorary Professor of Kyushu University, Dr. Kikuo Nomoto
Chairman of Higashi Sapporo Hospital, Dr. Kunihiko Ishitani
Conducted by: Higashi Sapporo Hospital Inc.

2. New Material : Fermented Bagasse

Fermented Bagasse is dietary fiber extracted from sugar cane grown in Okinawa, which contains xylooligosaccharide. Sugar cane is cultivated throughout Okinawa. The by-product of sugar extraction (sugar juice extracted from sugar cane is a raw material for white or brown refined sugar) is a fiber called Bagasse, which is then **fermented using steam explosion treatment.**



This process softens the hard sugar cane fiber, resulting in a versatile (or functional) material which can be used in various kinds of food.

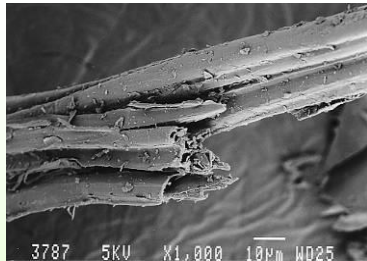
< Manufacturing process of Fermented Bagasse >



Sugar cane



Sugar cane fiber (Bagasse)



(Photo by an electron microscope)

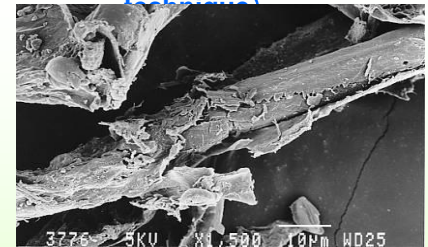
Fiber placed under environment of high temperature and high pressure for a certain period of time, then "steam exploded" by lowering pressure to atmospheric level ("steam explosion treatment"), and pH value adjusted through controlled addition of calcium chemicals.



After fermentation, fiber is dried.



Fermented Bagasse
(Bagasse treated by steam explosive fermentation technique)



(Photo by an electron microscope)

<p>Sugar Cane Fiber (Insoluble Dietary Fiber) 80%</p>	<p>Other Useful ingredients created as a by-product of the steam explosion and fermentation process</p>	<p>Fermented Bagasse (Insoluble Dietary Fiber) 54%</p>
		<p>Water-soluble Dietary Fiber Xylooligosaccharide Antioxidant activity Others Total:26%</p>

3. Why is dietary fiber necessary ?

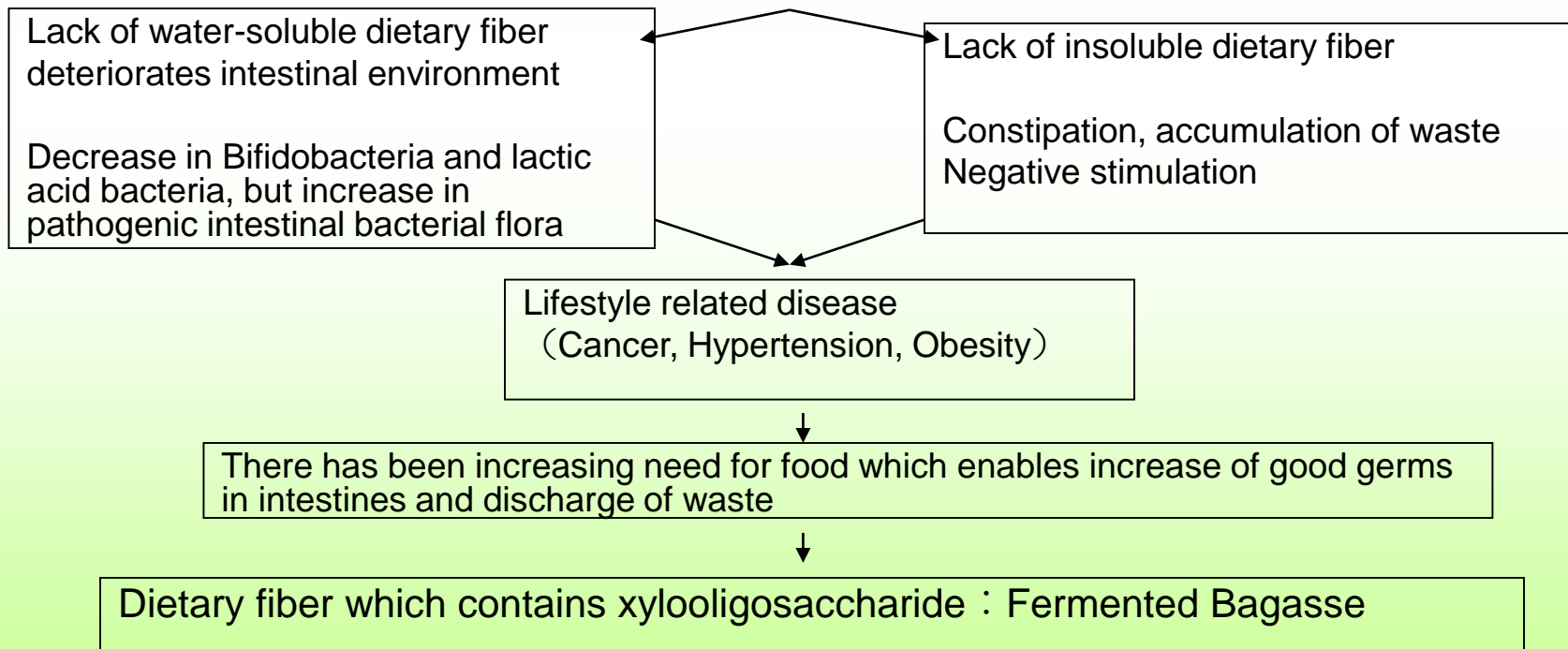
Changes in Japanese eating habits

Changes in the amount of the intake of dietary fiber (20% decrease, compared with 30 years ago)

The Ministry of Health, Labor, and Welfare (MHLW) acknowledged that dietary fiber is one of the nutrients that should be taken more.

Recommended daily dietary fiber intake 27 g : **announced by MHLW in 2004**

↓
Current average amount Japanese daily dietary fiber intake 14 g (deficiency of as much as 13 g), Korea: 19.8g, USA: 15.1g.



4. Functionality of Fermented Bagasse



The “beneficial bacteria” in your intestines increase by absorbing dietary fibers and oligosaccharides contained in fermented bagasse.

When “beneficial bacteria” increase, the pH value in your intestines decreases, creating an environment in which “harmful bacteria” are difficult to grow.

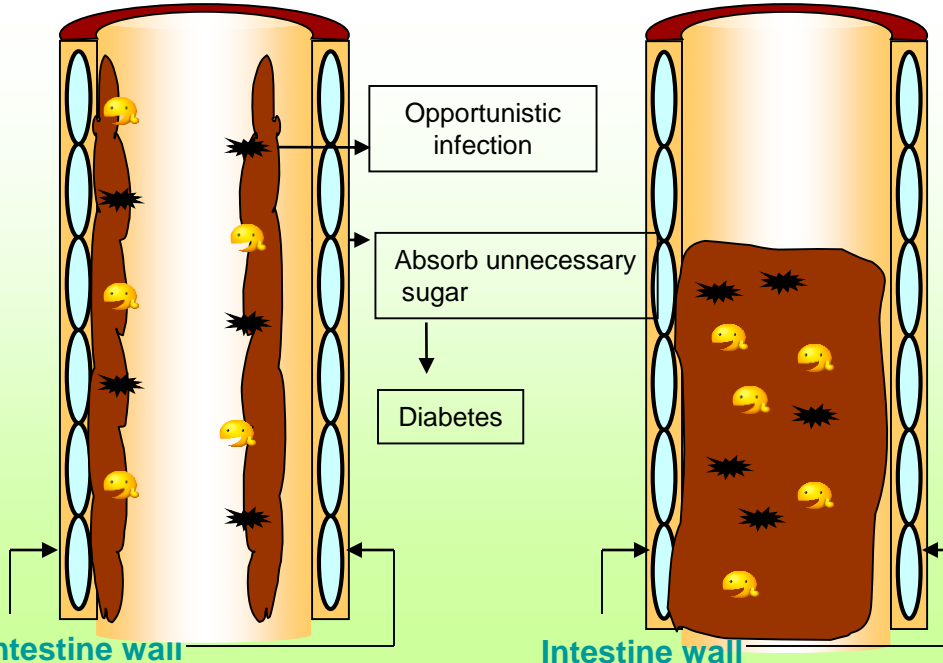
In addition, dietary fibers enclose “harmful bacteria” and unnecessary glucose and discharge them out of your body.

Activities of Dietary Fibers in Intestines (Insoluble dietary fibers and water-soluble dietary fibers)

Probiotics and Prebiotics

Intestine which tends to cause constipation (unhealthy intestine)

Healthy intestine



Inside the human intestines, 100 varieties more than 100 trillion germs exist. The balance/ratio of those is decided soon after birth.

• **Probiotics**

Oral intake. Help improve the balance of intestinal microorganisms.

• **Prebiotics (Fermented bagasse)**

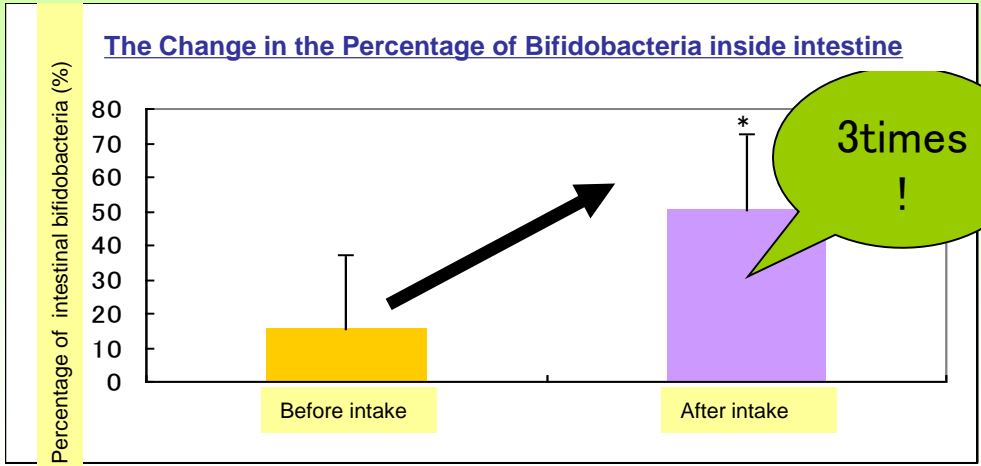
Help increase existing intestinal beneficial bacteria.

Xylooligosaccharide increases the number of beneficial bacteria, and insoluble dietary fibers contained in fermented bagasse help form healthy feces and discharge them out of your body.

5. Expected Effects of Fermented Bagasse

- ① Improve bowel movements by supplementing dietary fibers
- ② Improve the condition of intestinal germs by supplementing xylooligosaccharide.
- ③ Antioxidant effects of Ferulic acid, p-Hydroxybenzoic acid.

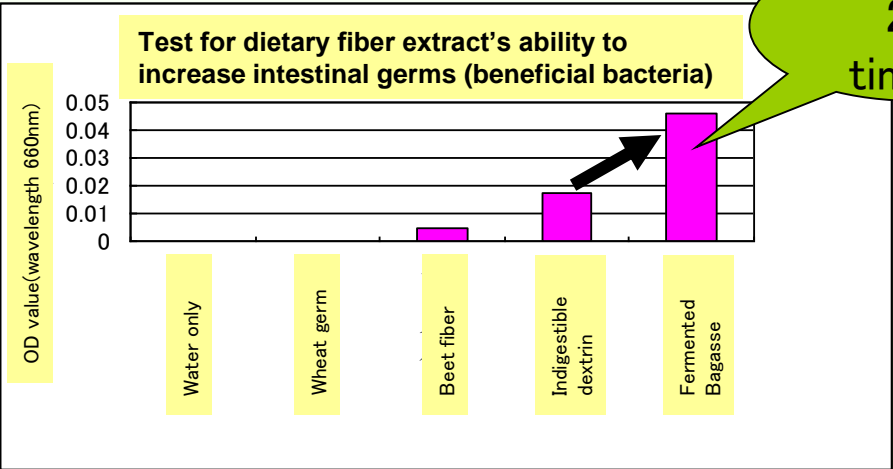
6. Increase in beneficial bacteria by taking Fermented Bagasse



It has been known that Fermented Bagasse can increase beneficial bacteria (bifidobacteria and lactic acid bacteria) in intestines. **When a person takes 10g Fermented Bagasse per day for a week, the percentage of bifidobacteria inside intestine increases three times** as much as those before taking Fermented Bagasse.

7. Comparison of intestinal germs after taking various kinds of dietary fiber extract

Test for dietary fiber extract's ability to increase intestinal germs



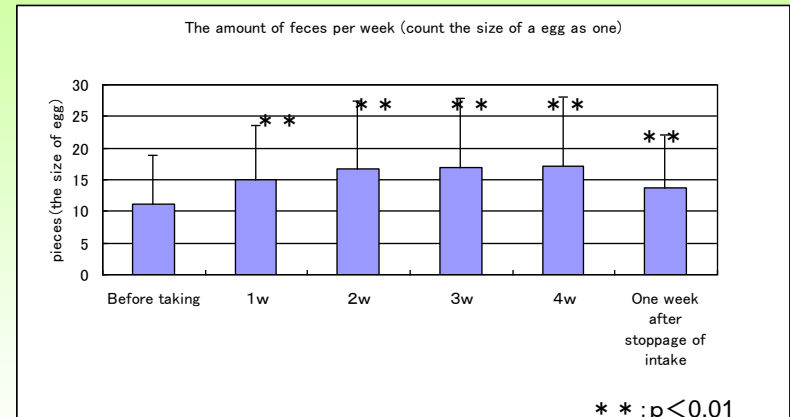
Human intestinal germ based bifidobacteria (beneficial bacteria) is planted in a medium on which one of the various kinds of dietary fiber extract is added, and cultivate it at 37°C for 12 hours, and compare each of them to see which has the most increased number of intestinal germs.

As a result, it is observed that **Fermented Bagasse** most effectively increased the **bifidobacteria (beneficial bacteria)** than any other extracts.

8. Human Test

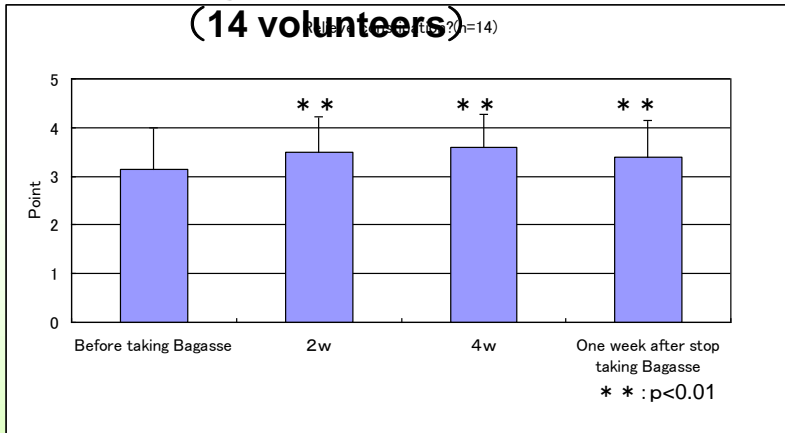
- Place where tests were conducted : Higashi Sapporo Hospital
- Number of volunteers : 63
- Age : 35. 13 ± 10.4 years old
- Gender Constitution : Male 11, Female 52
- Healthy people (Normal)
- Take 10g/day for 4 weeks, and conduct sampling tests of urine and blood as well as questionnaires one week after stoppage of intake.

① Changes in weight of feces (/week) (63 volunteers)



One week after starting to take Bagasse, improvement of bowel movements was also observed.

② Effects on Constipation (Intake:10g/day)



4 points: Have no symptom of constipation

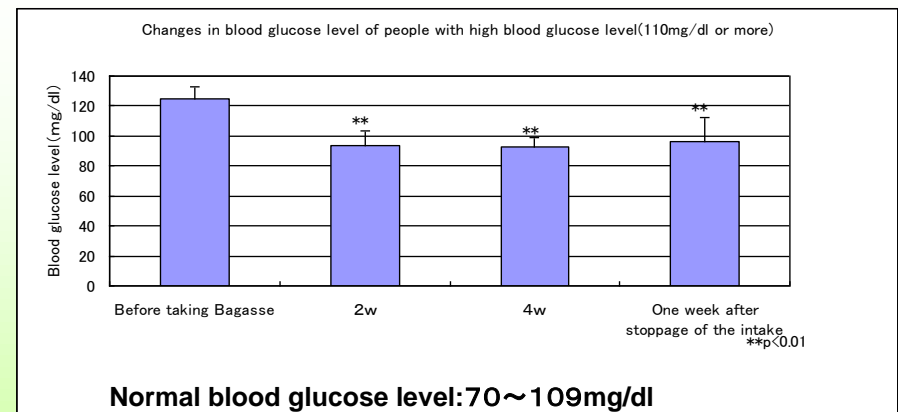
3 points: Have a light symptom of constipation

2 points: Have a symptom of constipation

1 point: Have a severe symptom of constipation

Fermented Bagasse effectively improved constipations.

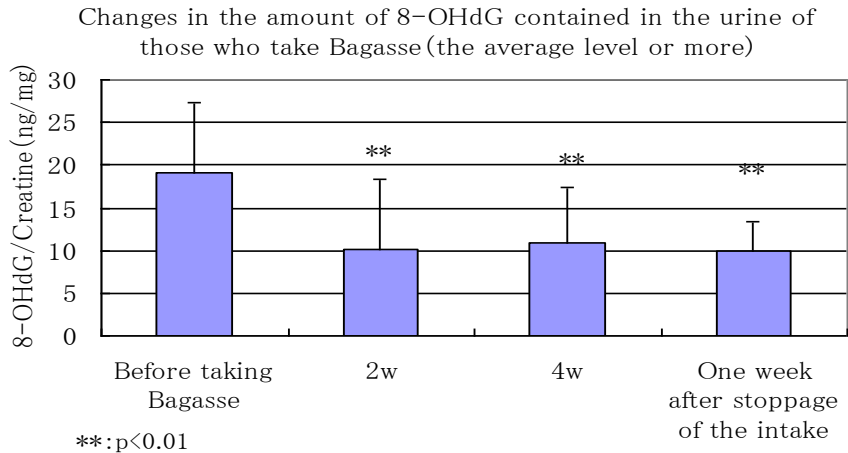
③ Impact on people who have high blood glucose level (6 volunteers) (Fasting blood glucose level:110mg/dl or more)



Effectively suppressed the increase of blood glucose level.

No influences were observed on those people with normal blood glucose levels.

④ Evaluation of antioxidant activities inside human body (9 volunteers)



Effectively decreased in the cases of 2 weeks and 4 weeks after the intake, and 1 week after stopping the intake.

8-OHdG means:

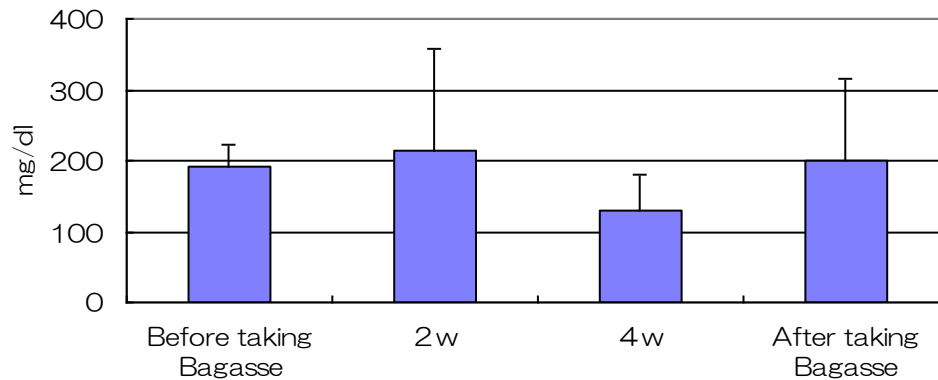
8-Hydroxydeoxyguanosine

When DNA is attacked by active oxygen, restoration of DNA starts. When this happens, part of attacked DNA is discharged as 8-OHdG in urine. Therefore, if the level of 8-OHdG in urine is high, it indicates very high level of oxidation stress.

8-OHdG: Standard value: 15.7 or more (Creatine adjusted)

Reference: Japanese Journal of Clinical Medicine No.62
Special Edition 11 PP541-543 (2004.11.28)

⑤ Impact on people with relatively high neutral fat (8 volunteers)

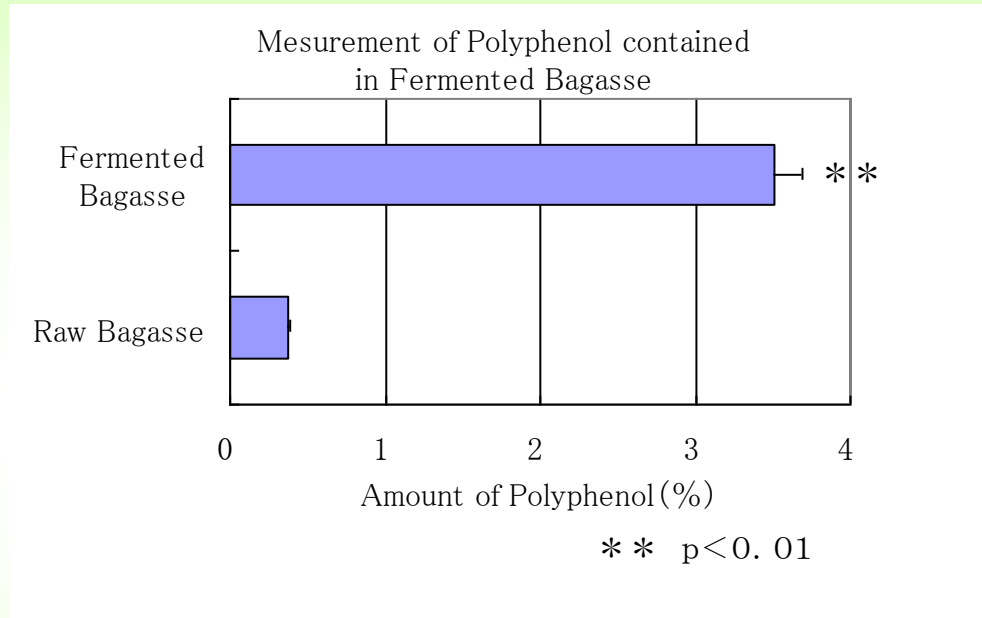


Normal level : 50~149mg/dl

Through the consumption of Fermented Bagasse, a downward trend in fat levels was observed.

9. Antioxidative activity ingredient in Fermented Bagasse (Polyphenol)

● Comparison of the amount of Polyphenol



In Fermented Bagasse, the amount of Polyphenol effectively increased by **about 8 times**

● Antioxidative activity ingredient

- ① *p*-hydroxybenzoic acid
- ② *p*-hydroxycinnamic acid
- ③ Ferulic acid
- ④ Ferulic acid arabinose ester

**Ferulic acid has the strongest antioxidative activity effects.
Contained amount: 34mg/100g**

10. General Ingredients of Fermented Bagasse (Powder) per 100g

moisture	3.76g
Protein	1.89g
Lipid	0.92g
Ash	3.06g
Carbohydrate	36.16g
Energy	268.9kcal
Dietary fiber	54.21g

11. The Amount of Minerals contained in Fermented Bagasse

Analysis Items	Bagasse	Fermented Bagasse
Calcium	211.6	833.9
Sodium	10.3	16.9
Magnesium	37.2	37.2
Potassium	113.6	113.6
Zinc	1.4	1.4
Iron	35.8	45.6

12. Standard

- **Xylooligosaccharide (the total of xylobiose and xylotriose) : 2.0% (W/W) or more**
- **General live microorganisms : 5.0×10^4 /g or less**
- **E. coli : negative**
- **Arsenic 2ppm or less Heavy metals 20ppm or less**
- **Remained agricultural chemicals :**
 - DDT : 0.5ppm or less**
 - BHC : 0.002ppm or less**
 - Endrin : Not detected**
 - Dieldrin : 0.01ppm or less**
 - Aldrin : 0.01ppm or less**
- **Sodium : 30mg/100g or less**

13. Bagasse

[Standard Package]

Weight : 480 g (Cookie 300 g (30 g × 10 packs) / Drink 180 g (18 g × 10 packs))

[Recommended retail price]

6825 yen (Tax inclusive)

Having “Fermented Bagasse” – a new dietary fiber grown in Okinawa– as its major material, we made cookies and drinks. This is a diet food consisting of a set of cookies and drinks which you can eat and drink instead of having a normal meal.



New material : Fermented Bagasse
(Bagasse treated by steam explosive and fermentation technique)

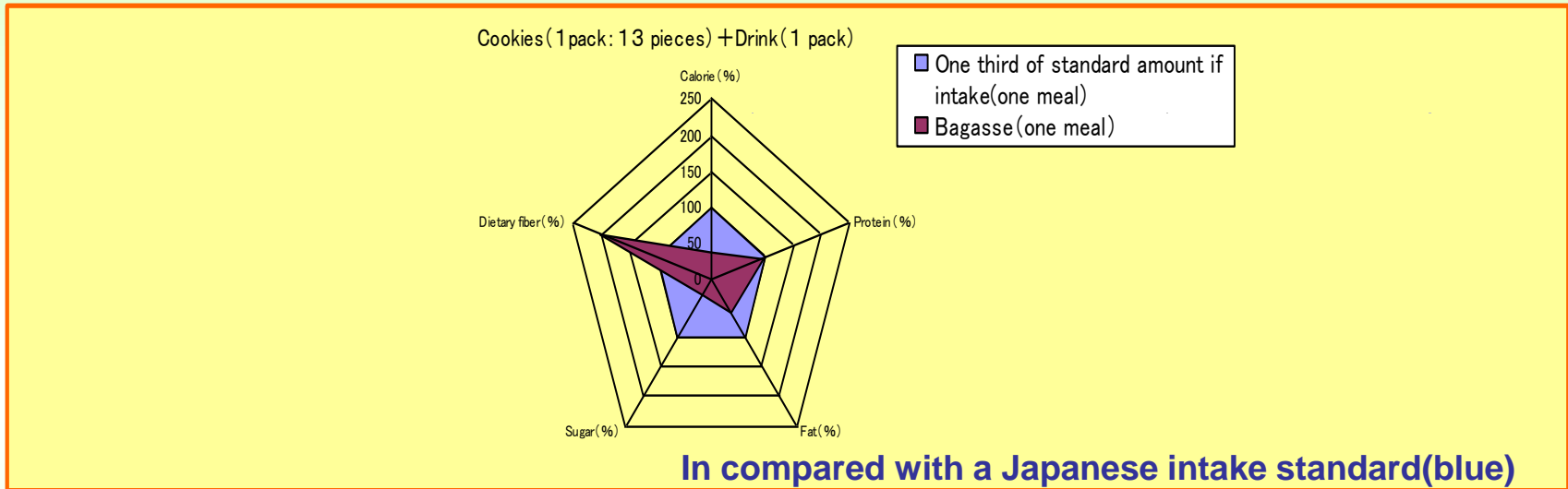


Drink(Plain flavor)

Cookie(Cocoa flavor)

14. Bagasse

With one meal of Bagasse, you can intake enough dietary fiber (insoluble dietary fiber and water-soluble dietary fiber) which tends to be insufficient in Japanese dietary habits.



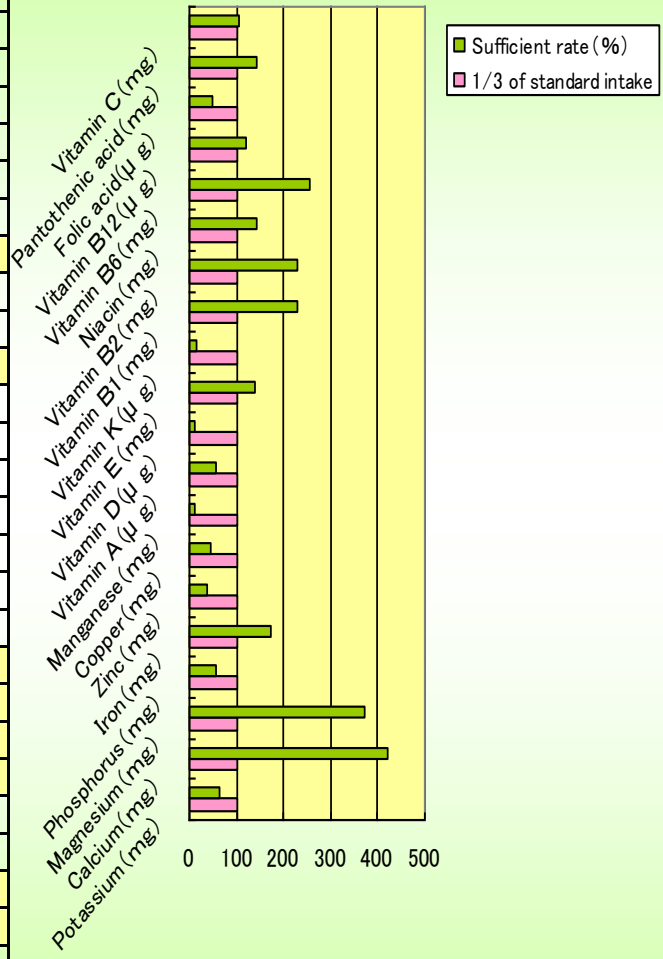
	1/3 of standard intake	Cookies + Drink	Sufficient rate (%)
Calorie (kcal)	666	183.728	27.59
Protein (g)	16.6	10.714	64.54
Lipid (g)	15	7.59	50.60
Carbohydrate (g)	83.3	15.185	18.23
Dietary fiber (g)	5.6	11.26	201.07

Bagasse provides 200% of the Japanese standard intake of dietary fiber with only one meal, while suppresses the intake of fat and sugar but supplements enough protein (when Bagasse is taken with low-fat milk) .

15. Bagasse

<Cookies(13 pieces)+Drink(1 pack)>

Calorie (k c a l)	666	183.728	27.59	
Protein (g)	16.6	10.714	64.54	
Lipid (g)	15	7.59	50.60	
Carbohydrate (g)	83.3	15.185	18.23	
Dietary fiber (g)	5.6	11.26	201.07	
Sodium (m g)		72.546		
Potassium (m g)	533.3	112.538	21.10	
Calcium	200	676.2	338.10	210~600m g
Magnesium (m g)	93.3	329.751	353.43	250~300m g
Phosphorus (m g)	300	60.932	20.31	
Iron (m g)	3.5	5.912	168.91	2.25~10m g
Zinc (m g)	2.3	0.369	16.04	3~15m g
Copper (m g)	0.2	0.083	41.50	0.5~5m g
Manganese (m g)	1.1	0.099	9.00	
Vitamin A (μ g)	200	99.382	49.69	180~600 μ g
Vitamin D (μ g)	1.6	0.154	9.63	0.9~5 μ g
Vitamin E (m g)	2.6	3.627	139.50	3~150m g
Vitamin K (μ g)	21.6	3.376	15.63	
Vitamin B1 (m g)	0.3	0.638	212.67	0.3~25m g
Vitamin B2 (m g)	0.4	0.69	172.50	0.33~12m g
Niacin (m g)	4	5.627	140.68	3.3~60m g
Vitamin B6 (m g)	0.4	0.976	244.00	0.3~10m g
Vitamin B12 (μ g)	0.8	0.474	59.25	0.6~60 μ g
Folic acid (μ g)	80	39.075	48.84	60~200 μ g
Pantothenic acid (n	1.6	1.665	104.06	2~30m g
Vitamin C (m g)	33.3	35.639	107.02	24~1000m g
Oligosaccharide (%)		0.113		



Bagasse provides one third of necessary daily intake of nutrients needed for women's body, such as vitamins(vitamins, niacin, pantothenic acid) and minerals (calcium, magnesium, iron) with fewer calories than normal meals.

16.Bagasse

■How to consume

- Dissolve Bagassa drink in water, hot water or low-fat milk.
- Bagasse also tastes great when dissolved in soymilk with cocoa/coffee powder added.
- Stir it before you drink, as precipitation comes out of insoluble dietary fiber of Fermented Bagasse.
- Drink Bagasse soon after dissolving it.
- Consume drink and cookies soon after opening each pack.

■Cautions

- Take a set of Bagasse drink and cookies replacing one or two normal meals with Bagasse. Up to 2 Bagasse meals per day is recommended.
- Immediately stop taking Bagasse, when Bagasse does not suit your physical conditions.
- If you have a food allergy, please make sure the allergen is not included in Bagasse ingredients.
- Please consult a doctor, pharmacist, or other specialists before consumption of Bagasse, if you are pregnant, breast-feeding, under medication, under age, or feeling very weak.

■Ingredients

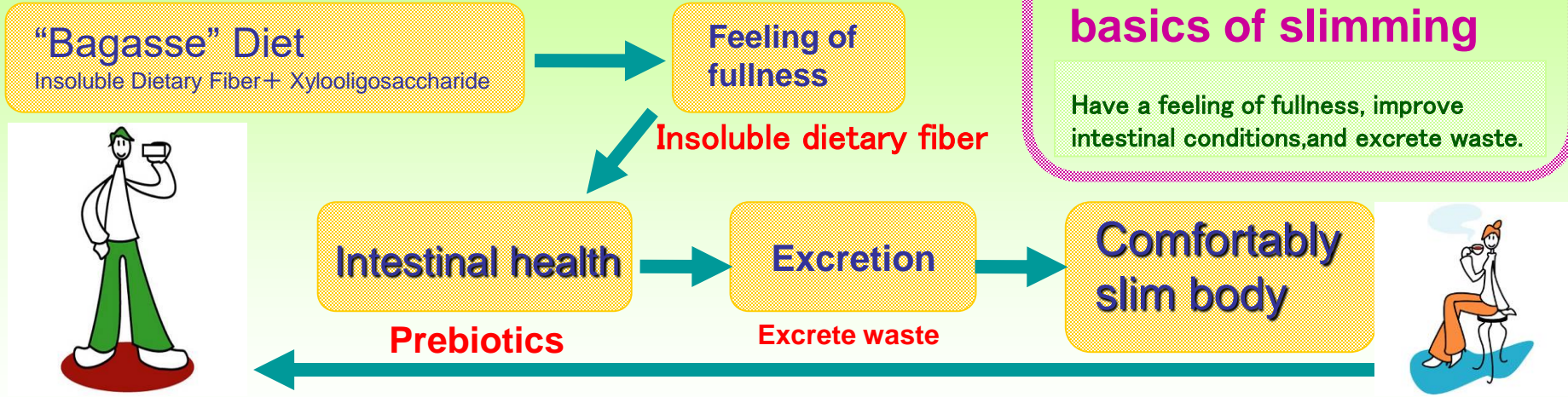
[Cookies (Cocoa flavor)]

Flour, margarine, sugar, soybean protein, fermented bagasse (made in Okinawa), indigestible dextrin, almond powder, powdered egg, cocoa powder, whey powder, dolomite (calcium carbonate and magnesium contained), brown sugar, baking powder, ferric pyrophosphate, sweetener (sucralose), pantothenic acid, V.E, niacin, V.B2, V.B1, V.B6, V.A, folic acid, V.D, V.B12

[Drink (Plane flavor)]

Creaming powder (condensed milk), powdered soybean protein, indigestible dextrin, fermented bagasse (made in Okinawa), dolomite (calcium carbonate and magnesium contained), sugar, emulsifier, sweetener (acesulfam K), V.C, nicotinamide, V.B6, V.B1, V.B2, folic acid, V.B12 (milk and milk-based products are contained in some ingredients)

17.The mechanism of “Bagasse” Diet



How to combine with meals

Breakfast	Normal meal	Normal meal	Bagasse Diet	Bagasse Diet	Bagasse Diet	Normal meal	Breakfast
Lunch	Normal meal	Bagasse Diet	Normal meal	Bagasse Diet	Normal meal	Bagasse Diet	Lunch
Dinner	Bagasse Diet	Normal meal	Normal meal	Normal meal	Bagasse Diet	Bagasse Diet	Dinner

Replace one meal a day with Bagasse

Replace two meals a day with Bagasse



Summary

- Material developed by investing funds allocated as extraordinary budget of Japan Science and Technology Agency (JST), an Independent Administrative Institute under the MECSSST
- Joint R&D with a hospital
- Insoluble fibers facilitate excretion of retained feces
- Nutritious functional food with a lot of nutrition and vitamins
- Contain natural xylooligosaccharide
- A set of cookies and a drink with only 184kcal per meal (Chewing cookies into small pieces makes you feel full)
- Moderate low price range, easy to buy

List Price : 6,825 yen (tax inclusive)
10 meals (10 packs each for cookies and drinks)