L-Arabinose
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• L-Arabinose a Pectin Sugar is a monosaccharide widely existing in plants

• L-Arabinose is approved to be used as a safe food additive by the United States Food and Drug Administration and Japan.

• L-Arabinose is a non-calorie natural compound sweetener
  – US Medical Association approves the use of L-Arabinose as the nutritional supplements or non-prescription drugs for anti-obesity.
  – Japan approves L-Arabinose to be the special health-care food additive for adjusting blood sugar.
L-arabinose, A natural sucrase inhibitor

A naturally occurring Arabinose is an L-form, and because it is not metabolized in humans it has no caloric value.

L-arabinose has been used as an intermediate ingredient in the Flavor Industry to produce Flavors,

Pharmaceutical Industry for product of L-Ribose, L-Carnitine and Biological Culture medium.
L-arabinose, A natural sucrase inhibitor

L-arabinose strongly inhibits the absorption of Sucrose from the small intestine. Adding 2-3% of L-arabinose with Sucrose causes an approximate 60% reduction of the digestion of Sucrose in the small intestine.

The undigested Sucrose and L-arabinose produces a short-chain Fatty Acid and thus functions similarly to dietary fiber.

L-arabinose has great merits as a sweetener and food additive to help regulate blood sugar levels, combat obesity, and to maintain good health.
L-Arabinose Benefits

- Widely found in fruits and vegetables, but not much
- Always form in Hetero-polysaccharide present in pectin, hemicellulose, pectin acid, bacterial polysaccharides
- Early process is difficult and costly
L-Arabinose Reduce the absorption of sucrose

L-Arabinose decreases the sucrose absorption

Normally, the sucrose absorbed by the human body is catabolized and produces Carbon Dioxide, which is excreted through exhalation. When L-Arabinose is taken together with sucrose, the level of Carbon Dioxide excretion becomes moderate compared to when sucrose is taken alone. In other words, when sucrose is taken with small amount of L-Arabinose, it will effectively suppress the digestion and absorption of sucrose.
L-Arabinose is calories-free sugar

• Use the isotopes to detect carbohydrate content in the gastrointestinal of rats
• Result: Arabinose is not absorbed by the small intestine

(Osaki et al., 2000)
L-Arabinose Reduce the absorption of sucrose

Sucrose Absorption is suppressed to approximately 60% of Normal
Sucrose digestion and absorption by the body after metabolism to carbon dioxide emissions. By adding L-arabinose can significantly reduce carbon dioxide emission, which means significantly reducing the digestion and absorption of sucrose.
L-Arabinose can inhibit the blood glucose increased

Under normal conditions, uptaken sucrose is digested and absorbed in the small intestine, resulting in the elevation of blood glucose levels. When L-Arabinose is taken together with sucrose, its digestion and absorption is suppressed. As a result, the elevation of blood glucose level is suppressed.
L-Arabinose can inhibit the blood glucose increased

8 healthy subjects (27-54 years old), cross-test in blood glucose and Insulin

Taking 4% L-arabinose:
• Slow down the rate of increased of blood sugar
• Reduce the blood glucose concentration
• Reduce the insulin concentration

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50g glucose | Add 4% L-Arabinose
---|---
First Group 4 people | Second Group 4 people
Second Group 4 people | First Group 4 people

(Inoue et al., 2000)
L-Arabinose can inhibit the blood glucose increased.

- ■: sucrose (50g)
- □: sucrose +4% arabinose
n=8 (27-54 years old)
*p<0.05, **p<0.01

Taking 4% arabinose after 30 minutes, blood glucose and insulin are significantly reduced.

(Inoue et al., 2000)
L-Arabinose can inhibit the blood glucose increased.

Take 3% of the L-Arabinose After 60 minutes, blood glucose and insulin are significantly reduced.

- ■: sucrose (30g)
- □: sucrose +3% arabinose

n=10 (48-75 years old and have Type 2 Diabetes)

*p<0.05

(Inoue et al., 2000)
3% L-Arabinose can effectively reduce the blood glucose even after two hours

Healthy subjects: n= 9
• test meal is divided into:
  • experimental group - coffee with 15g Sucrose + 0.45g arabinose (3% of the Sucrose)
  • control group - containing Sucrose 15g in the coffee

The area under the curve AUC (Area under the curve) of a significant reduce the increased of blood glucose level.

Healthy subjects: 21 males and three females, aged 40.9 ± 10.7, BMI 22.8 ± 3.6
• Test meal is divided into:
  • Experimental group - Sucrose 40g + arabinose 2g (5% of sugar)
  • Control Group - sucrose 40g

• Sucrose-Load meal:
  - Bean Jelly 90g (including sugar 40g)

Take L-arabinose before eating Bean jelly, the blood glucose levels increased is easy to control.
L-Arabinose helps intestinal microbial activity

**TABLE 1**

*Effects of arabinose feeding on the weights of body, liver, adipose tissue, cecum with wet content, pH of cecum contents and plasma glucose concentration in rats fed CS30, CS20, CS10, C or CGF20 diet*¹,²

<table>
<thead>
<tr>
<th>Diet and L-arabinose content, %</th>
<th>Body (g)</th>
<th>Liver (g)</th>
<th>Epidydimal adipose tissue (g)</th>
<th>Cecum with wet contents (g)</th>
<th>Cecum contents pH</th>
<th>Plasma glucose (mmol/L)</th>
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</thead>
<tbody>
<tr>
<td><strong>CS30</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2.12 ± 0.17</td>
<td>7.55 ± 0.36</td>
<td>12.2 ± 0.33</td>
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<tr>
<td>5</td>
<td>2.88 ± 2.14</td>
<td>5.00 ± 0.37</td>
<td>11.3 ± 1.05</td>
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<tr>
<td>13.4 ± 2.65</td>
<td>4.90 ± 0.10</td>
<td>12.0 ± 0.55</td>
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<tr>
<td><strong>CS20</strong></td>
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</tr>
<tr>
<td>2</td>
<td>2.28 ± 0.28</td>
<td>7.80 ± 0.22</td>
<td>11.4 ± 0.74</td>
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<td>5</td>
<td>6.50 ± 1.22</td>
<td>5.32 ± 0.11</td>
<td>11.5 ± 0.65</td>
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<tr>
<td>10.8 ± 1.42</td>
<td>4.60 ± 0.22</td>
<td>10.9 ± 1.29</td>
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<tr>
<td><strong>CS10</strong></td>
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<tr>
<td>2</td>
<td>3.03 ± 0.56</td>
<td>7.87 ± 0.25</td>
<td>10.8 ± 0.19</td>
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<td>4.54 ± 1.47</td>
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<td>10.9 ± 0.44</td>
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<td>6.67 ± 1.09</td>
<td>5.28 ± 0.47</td>
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<tr>
<td><strong>C</strong></td>
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<tr>
<td>2</td>
<td>3.06 ± 0.57</td>
<td>7.87 ± 0.19</td>
<td>11.0 ± 1.00</td>
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<tr>
<td>5</td>
<td>2.91 ± 0.03</td>
<td>7.30 ± 0.10⁹</td>
<td>10.9 ± 0.27</td>
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<tr>
<td>3.05 ± 0.81</td>
<td>6.70 ± 0.10⁹</td>
<td>11.0 ± 1.25</td>
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<td><strong>CGF20</strong></td>
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<tr>
<td>0</td>
<td>214 ± 13</td>
<td>10.4 ± 0.61</td>
<td>1.79 ± 0.22</td>
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<tr>
<td>0.5</td>
<td>212 ± 12</td>
<td>10.9 ± 1.10</td>
<td>1.98 ± 0.12⁹</td>
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<tr>
<td>1</td>
<td>211 ± 20</td>
<td>10.6 ± 0.72</td>
<td>1.74 ± 0.09**</td>
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</tbody>
</table>

(Seinai et al., 1997)

- 2% and 5% L-arabinose fed in 10 days, were increased stool weight and decreased pH value in rats.
- pH value decreased can help intestinal microbial metabolic activity

*¹,²*
L-Arabinose helps intestinal microbial activity

Intestinal bacteria produce short chain fatty acids → reduce body fat accumulation SCFA

SCFAs: Saturated fatty acids of five or fewer carbon atoms

(Tremaroli et al., 2012)
L-Arabinose reduction body fat accumulation in rabbits

Control: PBS
Fat rate: 1.185 ± 0.149 (g/100 body weight)

High Dose: 1.24 g/day
Fat rate: 1.185 ± 0.149 (g/100 body weight)

Low dose: 1.11 g/day
Fat rate: 1.185 ± 0.149 (g/100 body weight)
Arabinose Certification
**EAFUS: A Food Additive Database**

This information is generated from a database maintained by the U.S. Food and Drug Administration (FDA) Center for Food Safety and Applied Nutrition (CFSAN) under an ongoing program known as the Priority-based Assessment of Food Additives (PAFA). PAFA contains administrative, chemical and toxicological information on over 2000 substances directly added to food, including substances regulated by the U.S. Food and Drug Administration (FDA) as direct, "secondary" direct, and color additives, and Generally Recognized As Safe (GRAS) and prior-sanctioned substances. In addition, the database contains only administrative and chemical information on less than 1000 such substances. The more than 3000 total substances together comprise an inventory often referred to as "Everything Added to Food in the United States (EAFUS)."
ARABINO IS A FUNCTIONAL NATURAL SWEETENER WHICH HAS A POTENTIAL TO BE USED FOR WIDE RANGE OF NEW PRODUCT DEVELOPMENTS
Thanks For Your Attentions