Potential Health Benefits of a Natural Fiber from Sugarcane

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Backyard Remedies: How Plants from Louisiana Help Maintain Health
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Outline

• Background

• Why sugarcane fiber?

• Clinical pilot study
Fiber

- Complex class of substances consisting of the edible, non-starch, polysaccharide portion of plant foods generally classified into:
  - Soluble → dissolves in water to form a gelatinous substance that is fermented in the large intestine
  - Non-soluble → absorbs water and moves through the digestive system, undergoing very little fermentation
## Examples of Fiber Sources

<table>
<thead>
<tr>
<th>Examples</th>
<th>Food Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-starch polysaccharides</strong></td>
<td></td>
</tr>
<tr>
<td>Insoluble</td>
<td>Celluloses, some hemicelluloses</td>
</tr>
<tr>
<td></td>
<td>Whole grains, wheat and corn bran, some fruits (avocado), some vegetables</td>
</tr>
<tr>
<td></td>
<td>(celery, cauliflower)</td>
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<tr>
<td>Soluble</td>
<td>β-glucans, pectins, gums, mucilages</td>
</tr>
<tr>
<td></td>
<td>and some hemicelluloses</td>
</tr>
<tr>
<td></td>
<td>Legumes, oats, nuts, some fruits (berries, bananas), some vegetables (broccoli,</td>
</tr>
<tr>
<td></td>
<td>carrots)</td>
</tr>
<tr>
<td>Analogous carbohydrates</td>
<td>Indigestible dextrins, polydextrose, resistant starches</td>
</tr>
<tr>
<td></td>
<td>Uncooked potato, green banana flour, high amylose corn, synthetically</td>
</tr>
<tr>
<td></td>
<td>manufactured products</td>
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<tr>
<td>Lignin substances*</td>
<td>Waxes, Cutin, Suberin, Tannin</td>
</tr>
<tr>
<td></td>
<td>Flaxseed, unrefined grains, legumes, some vegetables (broccoli, carrots,</td>
</tr>
<tr>
<td></td>
<td>cauliflower, spinach)</td>
</tr>
</tbody>
</table>

* Also considered to fall within the category of soluble fiber
Importance of Dietary Fiber

- Diets high in fiber have been shown to reduce the risk of type 2 diabetes and heart disease
- Academy of Nutrition and Dietetics recommends 25-35 g of fiber per day
- Average American diet contains ~10 to 15 g of fiber per day
- Obese adults and children have the lowest fiber intake
Proposed Mechanisms of Fiber Intake

Dietary fiber intake

- Increased bile acid excretion
- SCFA production & reduced cholesterol synthesis
- Reduced macronutrient absorption
- Low energy density
- Gastric distension & increased satiety
- Delayed gastric emptying
- Effect on gut hormones
- Reduced post-prandial responses

Body weight regulation

- Reduced LDL cholesterol

Improved glucose metabolism

Reduced risk of CVD

- Reduced risk of diabetes
- Reduced blood pressure

What is Sugarcane Bagasse?

• By-product from the manufacture of raw sugar from sugarcane
• Fiber material left over after cane juice is extracted during the milling process
  – Cellulose 46 %
  – Hemicellulose 24.5 %
  – Lignin 19.95 %
  – Fats and waxes 3.45 %
  – Ash 2.4 %
  – Silicon 2.0 %
  – Other substances 1.70 %
• Discarded...but Louisiana has lots of it
Sugarcane Processing

Courtesy of the Audubon Sugar Institute
Why Sugarcane Bagasse?

- Policosanol is a mixture of alcohols derived from sugarcane wax, yams, and beeswax
  - Reported to lower LDL, increase HDL, and have anti-clotting effects (results have been mixed)

- Unique source of organic fiber for use as a human dietary supplement
Pre-clinical Studies

Effects of dietary fibers on weight gain, carbohydrate metabolism, and gastric ghrelin gene expression in mice fed a high-fat diet

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- High fat diet alone vs high fat diet plus one of the following:
  - 10% sugarcane fiber (SCF) vs 10% psyllium (PSY) vs 10% cellulose (CEL)
- 12 week intervention
Results

- No difference in amount of food eaten
- Sugarcane fiber group gained the least amount of weight
- SCF and PSY groups had the lowest fasting blood sugar and insulin levels
Clinical Pilot Study

The Brownie Study

Can eating sugarcane fiber help you lose weight and decrease your risk for diabetes?

Pennington Biomedical is looking for individuals to participate in a research study that is examining the metabolic effects of eating food supplemented with sugarcane fiber.

Eligibility:
- Age: 18-50 years old
- BMI: ≥ 30

Earn up to $215 for participation

To participate in the BROWNIE study:
- Visit www.pbrc.edu/brownie to screen online
- Call (225) 763-3000 or
- Email clinicaltrials@pbrc.edu

Funded by a pilot grant from the Louisiana Clinical and Translational Science Center and by a Botanical Research Center grant.
Clinical Pilot Study

• Hypotheses
  – Eating food containing sugarcane fiber compared to cellulose or minimal fiber will improve glucose tolerance and insulin sensitivity
  – Sugarcane fiber consumption may aid in weight loss and prevent weight gain
  – Sugarcane fiber consumption will enhance gut hormones related to satiety
Methods

• Randomized double-blind placebo controlled pilot study in obese, insulin resistant adults

• Randomized to eat cookies/brownies supplemented with one of the following:
  – sugarcane bagasse (13g total per day)
  – cellulose (13g total per day)
  – minimal fiber (4g total per day)
Bagasse Processing
Preliminary Results

• 21 people completed the study
  – 7 in each group
• No significant adverse events were reported
• No significant weight change occurred
• Results were mixed
  – Suggestion of improved insulin sensitivity in the sugarcane fiber group
Future Aims

- Analysis of stool samples
- Consider a larger study with more people and for a longer period of time
- Development of other foods with sugarcane fiber
Summary

• Fiber supplementation has a role in the prevention of obesity, diabetes, and CV disease

• Finding an alternative use for bagasse as a fiber supplement would have important health and economic impact for Louisiana
Thank You

BACKYARD REMEDIES
HOW PLANTS FROM LOUISIANA HELP MAINTAIN HEALTH

TUESDAY, FEBRUARY 25
6:00–7:30 PM

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