Agenda

- Citri-Fi® Review
- Technical Review
- Recap/Summary
- Questions/Answers
The Evolution of Fiberstar

- Technology Developed at the U of M
- Patents Filed
- Citri-Fi Production Plant Completed – Clewiston, FL Utilizing Pulp Waste Stream
- Spin-Off of Fiberstar Bio Ingredients
- Milling Operation Established River Falls, WI
- January 2014 Initiation of Rag & Core Waste Stream On-Line
- Fiberstar Production Plant Begins $10M, 7,000 sq. ft., Expansion – Clewiston, FL
- May 1, 2014 John Haen New Appointed Pres/CEO
- Dryer #2 Commissioned Clewiston, FL
- Citri-Fi wins Food Ingredient Europe’s Gold Award for most Innovative Food Ingredient
- Citri-Fi wins Food Ingredient Europe’s Silver Award for most Innovative Food Ingredient
- 2001 WREF – WBIC Initial Investment
Citri-Fi® is produced from bi-product generated from the orange juice manufacturing process:

- Purchased directly and solely from the local Florida economy
- Derive functionality from plant components that are under-utilized
- Preserve nutritional composition of the components

Citri-Fi® 125 products are citrus peel derived from citrus processing

Fibrous Waste Stream Material  
Citri-Fi Fiber  
Re-Hydrated Citrus Fiber
Citri-Fi begins as raw orange fiber after the juicing process. The natural pulp cell structure is mechanically processed to create the extended surface area individual to Citri-Fi.
Citri-Fi Gelling
Value Proposition

- **Clean Label**
  - Citrus fiber – consumers understand “citrus” & “fiber”
- **GMO-free**
  - GM citrus has not been approved yet in US
- **No E-number**
  - International customer preference
  - Pectin, other gums and modified starches have E-numbers
- **Allergen-free**
  - Ideal for allergen-free formulating such as gluten-free
- **Cost Savings**
  - Pectin extension/replacement
  - Elimination of pre-hydration step
- **Texture**
  - Gelling properties in high sugar and low pH conditions
  - Superior final texture
  - Varying particle sizes to target specific textures
Examples of Citri-Fi Use

• Fruit Spreads
• Fruit prep – used in
  – Dairy
  – Confectionary
  – Bakery Fillings
  – Fruit Snacks
When Does Citri-Fi Replace Pectin?

Application Environment is Key!

- Solids are over °55 brix
- pH is between 3.1-3.5

**Brix, pH and dosage of Citri-Fi work together to manipulate the strength of the gel and grind size of CF for mouth-feel and visual appearance.**

If the sugar and pH aren’t optimal, NO GELLING WILL OCCUR. NO MATTER HOW MUCH CF IS ADDED!
Effect of Dosage

Apple preparation with 60°Bx and pH 3.1-3.2

Gel Strength

Citri-Fi (%)
Gelling Demo

- Effect of pH and Brix

40 % Apple pulp
55 % Sucrose
2 % Citri-Fi 100FG
0 - 0.3 % Citric Acid
@100 Water

pH 3.7
60°Bx

pH 3.5
60°Bx

pH 3.3
60°Bx

pH 3.2
60°Bx
Effect of pH

Apple preparation with 60°Bx and 2% Citri-Fi 100 FG

Gel Strength

pH value
Mesh size of Citri-Fi

- Citri-Fi 100 types are available in different mesh sizes but these do not differ in the composition.
- Mouthfeel and texture of food and beverages can be manipulated by changing mesh size of Citri-Fi.

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Average Particle Size</th>
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<tbody>
<tr>
<td>Standard</td>
<td>Citri-Fi 100</td>
</tr>
<tr>
<td></td>
<td>95% passing 30 mesh</td>
</tr>
<tr>
<td>Fine</td>
<td>Citri-Fi 100FG</td>
</tr>
<tr>
<td></td>
<td>90% passing 100 mesh</td>
</tr>
<tr>
<td>Micro Fine</td>
<td>Citri-Fi 100M40</td>
</tr>
<tr>
<td></td>
<td>90% passing 200 mesh</td>
</tr>
<tr>
<td>Micro Fine</td>
<td>Citri-Fi 100M20</td>
</tr>
<tr>
<td></td>
<td>Our smallest particle size.</td>
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</tbody>
</table>
Influence of Particle Size of Citri-Fi on Appearance & Texture

<table>
<thead>
<tr>
<th>Citri-Fi 100</th>
<th>Citri-Fi 100FG</th>
<th>Citri-Fi 100M40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse structure,</td>
<td>Fine pulpy</td>
<td>Very fine and</td>
</tr>
<tr>
<td>very pulpy</td>
<td></td>
<td>smooth</td>
</tr>
</tbody>
</table>
Baking Stability- Pre-Bake

72° Brix Raspberry Filling

1.0 % LM Pectin
35 % Fruit Pulp

0.5 % LM Pectin
1.2 % Citri-Fi 100
30 % Fruit Pulp

2.5 % Citri-Fi 100
30 % Fruit Pulp

**Using LM because HM doesn’t perform well for bake stability**

**Citri-Fi also provides the advantage of partial pulp replacement as well as the manipulation of texture.**
Baking Stability- Post-Bake

1.0 % LM Pectin
35 % Fruit Pulp

0.5 % LM Pectin
1.2 % Citri-Fi 100
30 % Fruit Pulp

2.5 % Citri-Fi 100
30 % Fruit Pulp
Yogurt with Fruit Preparation

<table>
<thead>
<tr>
<th>Soluble Solids (°Bx)</th>
<th>~40</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH-value</td>
<td>3.8 - 4.2</td>
</tr>
</tbody>
</table>

In the Pectin and Citri-Fi samples the fruit preps have enough viscosity to be layered with yogurt.

Fruit prep too thin to be layered.
FIE Innovation Award

- Based on the pectin replacement & gelling functionality
- Great team effort
Is Citri-Fi Only Used for Pectin Replacement/Extension?

Fruit Preparations
• Baking Stability
• Mouthfeel/Texture
• Partial Pulp Replacement

Also used extensively in the meat, bakery, dairy, beverage and sauces industries taking advantage of its water-binding and emulsion properties.
Thank you!

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