Global Rice Bran Oil Scenario and Way Forward

Xuebing Xu
Wilmar Global R&D Center
Global Rice Bran Oil Conference – 2015, Mumbai
2013 Rice Production by Country

- China, 200 MMT
- India, 160 MMT
- Indonesia, 71 MMT
- Bangladesh, 52 MMT
- Viet Nam, 44 MMT
- Thailand, 36 MMT
- Myanmar, 29 MMT
- Philippines, 18 MMT
- Brazil, 12 MMT
- Japan, 11 MMT
- Cambodia, 9.4 MMT
- United States of America, 8.6 MMT

From FAO, 2015
Rice Bran Oil Products in the Market

<table>
<thead>
<tr>
<th>Date Published</th>
<th>Asia Pacific</th>
<th>Middle East &amp; Africa</th>
<th>Europe</th>
<th>North America</th>
<th>Latin America</th>
<th>Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>22</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>2010</td>
<td>32</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>38</td>
</tr>
<tr>
<td>2011</td>
<td>38</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>46</td>
</tr>
<tr>
<td>2012</td>
<td>25</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
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<td>2013</td>
<td>38</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>42</td>
</tr>
<tr>
<td>2014</td>
<td>54</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>59</td>
</tr>
<tr>
<td>Total Sample</td>
<td>209</td>
<td>18</td>
<td>13</td>
<td>4</td>
<td>2</td>
<td>246</td>
</tr>
</tbody>
</table>

From GNPD, 2015
Typical Rice Bran Oil Products
RBO Benefits and Selling Point

- Phytosterols
- Tocopherol
- Oryzanol
- Squalene

- Lower cholesterol
- Improve sleep
- Anti-inflammatory
- Reduce CVD risk

The Aged
White Collar
Frying oil
Rice Bran Oil Production and Potential

In oilseeds market, China took 65 percent of total world exports in MY13/14

Exploitation of rice bran resource can decrease foreign oilseed dependency

From FAO & USDA, 2015
Future Trends in Oil Processing

- **Safe**
- **Nutritional**
- **No Waste**
- **Environmental Friendly**

**Traditional Processing Technology**
Ensure product quality to meet customers’ need

**White Biotechnology**
Technology innovation in processing

**Environmental Friendly**
Energy Saving and CO2 emission reduction
Existing Technique vs. Emerging Technique

Chemical Refining vs. Subcritical Extraction

Physical Deacidification vs. Ionic Liquid

Miscella Refining vs. Enzymatic Approach
Enzyme-involved processes

Yield/cost

Nutritional

Increase/decrease

Product

Phytosterol, tocopherol

Green

Waste water, chemicals use, energy, CO2

Environmental Friendly

High quality, new characteristics
Enzymatic Deacidification

MAG
DAG
Glycerol
Phytosterol...

Acyl Acceptor

FFA

Lipase

Triglyceride

Application

Decrease acid value

High DAG RBO

Oleogel
Enzymatic Degumming

Conventional

Phosphoric Acid

CRBO 600ppm

Acid

lye

Alkali

Degummed oil 100ppm

Enzyme

PLA₁ Water

CRBO 600ppm

Enzyme reaction tank

(50°C, 4~6h)

High shear mixer

Degummed oil 40ppm
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Enzymatic Process</th>
<th>Conventional Chemical Process</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Alkaline Process</strong></td>
</tr>
<tr>
<td><strong>Reaction Temperature (℃)</strong></td>
<td>30-50</td>
<td>60-90</td>
</tr>
<tr>
<td><strong>Feedstock</strong></td>
<td>Any grade of feedstock. Simultaneous conversion of TAG and FFA</td>
<td>FFA&lt;0.5%. Soap formation</td>
</tr>
<tr>
<td><strong>Water in Feedstock</strong></td>
<td>No effect on biocatalyst</td>
<td>Soap formation. Oil hydrolysis resulting more soaps</td>
</tr>
<tr>
<td><strong>Catalyst Removal</strong></td>
<td>Easy</td>
<td>Difficult, neutralization and repeated washing</td>
</tr>
<tr>
<td><strong>Glycerin Quality</strong></td>
<td>Transparent and salt-free</td>
<td>Black-brownish, and contains salt</td>
</tr>
<tr>
<td><strong>Environmental Impact</strong></td>
<td>low; wastewater treatment not needed</td>
<td>High; wastewater treatment needed</td>
</tr>
</tbody>
</table>
Enzymes get involved

- Stabilization
- Extraction
- Degumming
- Deacidification
- Bleaching
- Detoxification
- Interesterification

Rice Bran

Crude Oil

By-products

Refined Oil

- Biodiesel

Structured/nutrition fortification lipids
Innovative Mode---Industry Chain

Rice industry chain and the comprehensive utilization of by-products

Breeding

Contract farming

Rice processing

Brown rice

Rice hull

Rice bran

Rice bran oil

Rice bran meal

White carbon

Activated carbon

Electricity generation

Steam

Lecithin, wax, polysaccharide, inositol, dietary fiber

product development

White rice

Broken rice

Rice bran

Rice hull ash

Steam

cyclic economy

added value
Thank You & Questions?