Castor - *Ricinus communis*

Castor Oil / Ricinus Oil - Seeds of the Castor Plant.

Obtained by Pressing, Solvent Extraction or a Combination.

Brown / Dark Brown – Jamaican Black CO

Pale Straw Colour – Crude Form

Colourless / Slightly Yellow – Refined & Bleached.
BACKGROUND

➢ Contributes to only 0.15% of Vegetable Oil Produced Globally (Patel et al., 2016).

➢ Global Demand – 14 M Tonnes (Jam. Observer, April 2017)

➢ Supplies – 7.5 M Tonnes (Jam. Observer, April 2017)

➢ Global Castor Oil & Derivatives Market in 2015 – Exceeded US$1.3B (Grand View Research, August 2016)

➢ Projections for 2024 – US $2.33B (Grand View Research, August 2016)

➢ Global Annual Retail Sales for JBCO – US$75M – US$100M (JAMPRO, August 2016)
CASTOR OIL’S UNIQUENESS

➢ Only commercial source of hydroxylated fatty acid.

➢ High Purity: Fatty Acid Portion is about 90% Ricinoleic Acid.

➢ High Product Uniformity and Consistency.

➢ Nontoxic, Biodegradable, Renewable Resource.
CASTOR OIL APPLICATIONS

Important Commodity to Industry

- Food & Agriculture
- Cosmetics & Perfumeries
- Plastics & Rubbers
- Textile Chemicals
- Electronics & Telecommunications
- Pharmaceuticals
- Paints, Inks & Adhesives
- Lubricants
- Biofuels.
Seeds Contain:

- 40 – 55 % Oil
- 12 - 16 % Protein
- 5 % Moisture
- 3 – 7 % NFE (Sugars, Starches, etc.)
- 27 % Crude Fibre
- 2 - 2.2 % Ash
- Phosphorous, Uric Acid, Enzymes etc.
## COMPOSITION OF CASTOR OIL

<table>
<thead>
<tr>
<th>Acid Name</th>
<th>Average percentage Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ricinoleic acid</td>
<td>85 to 95%</td>
</tr>
<tr>
<td>Oleic acid</td>
<td>2 to 6%</td>
</tr>
<tr>
<td>Linoleic acid</td>
<td>1 to 5%</td>
</tr>
<tr>
<td>Linolenic acid</td>
<td>0.5 to 1%</td>
</tr>
<tr>
<td>Stearic acid</td>
<td>0.5 to 1%</td>
</tr>
<tr>
<td>Palmitic acid</td>
<td>0.5 to 1%</td>
</tr>
<tr>
<td>Dihydroxystearic acid</td>
<td>0.3 to 0.5%</td>
</tr>
<tr>
<td>Others</td>
<td>0.2 to 0.5%</td>
</tr>
</tbody>
</table>
COMPOSITION OF CASTOR OIL

General Fat / Oil

Castor Oil
COMPOSITION OF CASTOR OIL

Castor Oil’s Chemistry is based on the high Ricinoleic Acid Content and its Functionality:
PROPERTIES OF CASTOR OIL

➢ Unique Structure Offers Interesting Properties – Various Applications.

➢ Methods of Extraction affects Physical and Chemical Properties
  - Cold Pressed versus Solvent Extracted

➢ Physical and Chemical Properties Determine Quality.
PROPERTIES OF CASTOR OIL

Physical Properties

Hydroxyl Groups (OH) - Unique Combination of the Physical Properties:

- Relatively High Viscosity / Thickness
  - Unusual for Vegetable Oil
  - Important for Blending Lubricants

- Relatively High Specific Gravity
  - Heaviness of oil compared to water

- Solubility in Alcohol in any Proportion.
  - E.g. Methanol Allows for Conversion to Biodiesel.
PROPERTIES OF CASTOR OIL

Physical Properties

➢ Relatively High Shelf Life
  - OH group Prevents Peroxide Formation.
  - 1 – 2 Years, 3 – 4 Years?

➢ Hydroxyl Value
  - Measures free –OH groups formed on oil decomposition
  - Indicator of Rancidity - 10% reduction in HV after 90 days storage.

➢ Refractive Index
  - Measures Reduction in Light Speed Through Oil.
  - Indicator of Adulteration.
PROPERTIES OF CASTOR OIL

Physical Properties

➢ Fatty Acid Composition
  - Indicates Concentrations of Various Oil Components
  - Important for Industry e.g. Soap Formulators.

➢ Colour
  - Off – Colours - Inconsistency in Processing Method
  - Important for Product Consistency

➢ Odour
  - Off - Odours - Bacterial Contamination, Rancidity etc.
  - Important for Product Consistency
PROPERTIES OF CASTOR OIL

Chemical Properties

➢ Iodine Value
  - Estimates unsaturation of oil
  - Classifies oils: drying (130-200), semi-drying (100-130) or non-drying (< 100).

➢ Acid / Free Fatty Acid Value
  - Measures free fatty acids in oil
  - Indicator of inadequate processing or storage condition

➢ Peroxide Value
  - Measures rancidity in unsaturated fats and oil
Chemical Properties

➢ Saponification Value
- mg KOH required to saponify 1 g of fat.
- Measures the average MW of all fatty acids in oil.

➢ Unsaponifiable Matter
- Measures other organic components not saponified by alkali hydroxides.
- High UM retards ability to form soap.

➢ Moisture Content
- Measures water in the oil
- Affects SV, IV, Colour, Oil Yield etc.
**CASTOR OIL**

**CASTOR OIL, STANDARD OF QUALITY**

The quality of castor oil described in the sales contract shall be the designated grade conforming to the standard specification of the INTERNATIONAL CASTOR OIL ASSOCIATION, INC. (ICOA), as follows.

Castor Oil, a clear viscous liquid of the following types shall be the triglyceride oil derived from the seed of the castor plant, genus *Ricinus communis*.

<table>
<thead>
<tr>
<th>VALUES</th>
<th>AOCS TEST METHODS</th>
<th>ICOA CASTOR OIL SPECIFICATIONS (2003)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLOR-LOVIBOND, 5¼” SCALE</td>
<td>Cc 13e-92</td>
<td>20 Y 2.0 R MAX</td>
</tr>
<tr>
<td>HYDROXYL VALUE</td>
<td>Cd 13-60</td>
<td>160-168</td>
</tr>
<tr>
<td>VISCOSITY, STOKES</td>
<td>Tq 1a-64</td>
<td>6.3-8.9</td>
</tr>
<tr>
<td>FREE FATTY ACIDS</td>
<td>Ca 5a-40</td>
<td>1.00% MAX</td>
</tr>
<tr>
<td>MOISTURE &amp; VOLATILE</td>
<td>Ca 2c-25</td>
<td>0.25% MAX</td>
</tr>
<tr>
<td>INSOLUBLE IMPURITIES</td>
<td>Ca 3u-46</td>
<td>0.02% MAX</td>
</tr>
<tr>
<td>RICINOLEIC ACID CONTENT</td>
<td>ISO 5508/9</td>
<td>85% MIN</td>
</tr>
<tr>
<td>APPEARANCE @ 25°C</td>
<td>CLEAR AND FREE OF SUSPENDED MATTER</td>
<td></td>
</tr>
<tr>
<td>ODOR</td>
<td>SLIGHT, CHARACTERISTIC</td>
<td></td>
</tr>
<tr>
<td>SOLUBILITY IN ALCOHOL @ 20°C</td>
<td>COMPLETE WITHOUT TURBIDITY IN TWO VOLUMES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OF SPECIALY DENATURED ALCOHOL FORMULA 3A (95%)</td>
<td></td>
</tr>
</tbody>
</table>

**ADDITIONAL GENERAL SPECIFICATIONS**

| SPECIFIC GRAVITY @ 25/25°C            | Cc 10a-25         | 0.957-0.965                           |
| REFRACTIVE INDEX @ 25°C               | Cc 7-25           | 1.476-1.479                           |
| IODINE VALUE                          | Cd 1d-92          | 83-88                                 |
| SAPONIFICATION VALUE                  | Cd 3-25           | 175-185                               |
| UNSAPONIFIABLE                        | Ca 6a-40          | 0.7% MAX                              |
| COLOR-GARDNER                         | Td 1a-64          | 3 MAX                                 |
| ACID VALUE                            | Cd 3d-63          | 2 MAX                                 |

Rev. 4/12
Provision of Certificate of Analysis (COA)

✓ Complete List of Physical & Chemical Specifications of Product Tested.

✓ Ensures Product Conformity to Specifications.

✓ Ensures that Product is not Degraded / Contaminated.

✓ Contains Minimum, Maximum, Target Specifications.

✓ Extremely Important for Quality Control.
HOW CAN SRC ASSIST?

Provision of Certificate of Analysis (COA)

➢ Current Capabilities Include Determination of:
  - Moisture Content of Beans & Oil
  - Oil Content of Beans (Solvent Extraction)
  - Peroxide Value
  - Refractive Index
  - Specific Gravity
  - Saponification Value
  - Solubility in Alcohol
  - pH Value (If Required)
  - Fatty Acid Composition (Near Future)
HOW CAN SRC ASSIST?

Development of JAMAICAN Specifications for JBCO

- Traditional Processing Method Different
- Different Method = Different Oil Properties
- Different Oil Properties = Different Quality
HOW CAN SRC ASSIST?

➢ Develop Distribution Profile of JBCO
  - Collection of Oil Samples from Beans from Different Varieties of Castor Plant.
  - Involve Castor Oil Processors Island wide.
  - Compilation of Results into Standard Specifications (Collaboration).
Jamaican Black Castor Oil
INCI: Ricinus Communis (Castor) Seed Oil

Specifications

Analytical Details

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Jamaican Black Castor Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance:</td>
<td>Golden Brown to Blackish Viscous Oil</td>
</tr>
<tr>
<td>Odor:</td>
<td>Mild burnt to smoky</td>
</tr>
<tr>
<td>Free Fatty Acid:</td>
<td>1.0 Max</td>
</tr>
<tr>
<td>Acid Value:</td>
<td>2.0 Mg KOH/0.1g max</td>
</tr>
<tr>
<td>Solubility in Ethyl Alcohol:</td>
<td>Completely soluble without turbidity</td>
</tr>
</tbody>
</table>

Specific Gravity @ 30°C:
- 0.954-0.955

Refractive Index @ 40°C:
- 1.4704-1.4740

Iodine Value:
- 82-100

Saponification Value:
- 172-185 Mg KOH/g

Insoluble Impurities:
- 0.02% Max

Moisture:
- 0.25% Max

Hydroxyl Value:
- 158-165

Viscosity:
- 6.0-9.0 Poise

Black Castor Oil is extremely versatile and is easily incorporated into all kinds of cosmetics from rinse-off to leave-on products. It is highly emollient and is used to bind ingredients in cosmetic and soap formulas. Acts as a humectant with soothing and emollient actions. Recommended usage rate is 3-10%.

Shelf Life:
- 3-4 Years

Date: 01/13/2015

Disclaimer: All information, appearing herein on our products is based upon data that are believed to be reliable. However, it is the user's responsibility to determine the suitability of the product before use. Since the actual use of the product is beyond our control, no guarantee, express or implied, is made by Natural Sourcing of the product nor does Natural Sourcing assume any liability arising out of use, by others, of the product referred to herein.
THANK YOU ALL!!!