Quillaja Extract
Emulsifier: Q-Naturale®
By: Ingredion
Quillaja Extract Emulsifier
Q-NATURALE®
Overview

• Emulsifiers in Beverages with focus on Quillaja Saponin (Q-NATURALE®)
• What is Quillaja
• Quillaja extraction Process
• Unique Benefits
• Unique On Trend Applications
• Labeling
• Regulatory Overview
Global consumers’ view of natural ingredients

In most Western European countries, Japan and US, consumers are looking to buy food and drink products made with “natural” ingredients because they are perceived as:

– Making products safe
– Being “good for you”
– Having other benefits (e.g., authentic, artisanal, eco-friendly, etc.)

Source: Business Insights—Emerging Ingredients in Food & Drinks 2010
An emulsion stabilizer (also called “emulsifier”) is a molecule that has lipophilic (fat-loving) and hydrophilic (water-loving) properties. It creates a film around the oil droplets, and keeps them suspended in water as a stable emulsion.

Gum Arabic, Tweens, and OSA-modified starches are examples of emulsion stabilizers.
Typical beverage manufacturing flow process

- Mix Beverage
- Pasteurization*
- Cooling
- Carbonation*
- Packaging

*If needed
Typical Liquid Emulsions

- Flavor Emulsion
- Beverage Clouds
- Non-Dairy Creamers
Products for all your Applications

**Soft Drinks**
Emulsifiers to stabilize beverages

**Energy, Functional and Sports Drinks**
Stabilizing ingredients for nutrients, vitamins and actives

**Juice Drinks**
Ingredients to create cloudiness and turbidity

**Alcoholic Beverages**
Solutions to stabilizing alcoholic beverages

**Powdered Drinks and Instant Mixes**
Spray Dried ingredients to deliver high quality flavor to your powdered beverage.

**Creamers**
Both liquid & dry

**Dry mixes, spices & flavors**
Encapsulation
What is Quillaja Extract?

- Quillaja comes from Quillaja saponaria Molina (endemic to Chile)
- Processed through water purification without any chemicals
- Quillaja has been used for years as a beverage foaming stabilizer
- Bark exported from Chile since 1880
- A powerful surfactant similar to Polysorbate 80 but NATURAL
Quillaja: a sustainable and renewable source

Quillaja is cultivated by Desert King in partnership with the Chilean government.

From nursery

To forest
Natural extraction process / quality control

- Selected Quillaja, Supply
- Chipping
- Water Extraction
- Clarification
- Membrane Filtration
- Concentrate
- Pasteurization

- All-natural - No chemicals involved
- Organic Certified, Non GMO
- Eco-friendly - Grown in Chile in cultivated plantations
  - No trees are cut down!
- Stable supply and pricing
- Consistent Quality

[Logos and certifications]
Quillaja saponin - Q-Naturale Unique Properties

• Natural, clean label beverages
  – Superior alternative to gum arabic that is plagued by climatic and political conditions affecting price.

• High oil load – up to 4X higher than traditional systems for lower usage levels

• Concentrated emulsions made with Quillaja Saponin can reduces inventory, shipping and labor costs.

• Liquid – so ready to use

• Fine particle size emulsions for greater stability

• Delivers challenging actives such as omega-3s, vitamins and more

• Can be used in weighted beverages and non weighted.
Quillaja can be used in a broad range of oil to emulsifier ratios for formulation flexibility.

<table>
<thead>
<tr>
<th>EMULSIFIER</th>
<th>Q-NATURALE</th>
<th>GUM ARABIC</th>
<th>OSA STARCH</th>
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</thead>
<tbody>
<tr>
<td>OIL-TO-EMULSIFIER RATIO</td>
<td>4:1</td>
<td>1:1.5</td>
<td>1:1</td>
</tr>
<tr>
<td>OIL LEVEL</td>
<td>8–50%</td>
<td>8–12%</td>
<td>8–12%</td>
</tr>
<tr>
<td>DISSOLUTION OR HYDRATION TIME</td>
<td>none</td>
<td>1 day</td>
<td>1 day</td>
</tr>
<tr>
<td>MEAN PARTICLE SIZE (MICRON)</td>
<td>0.25</td>
<td>0.35</td>
<td>0.28</td>
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</tbody>
</table>

Q-NATURALE emulsifier offers the same stability as traditional emulsifiers at a broad range of usage levels and with less hydration time.
Q-NATURALE produces ~0.15µ emulsion particles for excellent emulsion and beverage stability.
Stabilized beverage emulsion

Good emulsion

Good emulsion has a fine droplet size $d_{50} < 0.5 \, \mu m$

Poor emulsion

Poor emulsion has large droplets $\sim 2 \, \mu m$
Natural/clean label beverages: formulation challenges

Stabilizing a natural beverage without adding artificial ingredients

• Weighting Agents like Ester Gums or SAIB
• BVO

Developing a cost-effective formulation

• Very Expensive
Drivers behind elimination of weighting agents

• Weighting agents constitute approximately half of the cost in emulsion
• Weighting agents contribute to opacity in some beverages and sediment in alcoholic beverages
• Time-consuming process in dissolving weighting agent
• Regulation limits weighting agent usage level
• Natural beverages cannot use weighting agents

Sara’s Petition?
Superior Stability at high oil load - with NO weighting agents.

Aged emulsion at 57°C = 6 months

Larger particle size
Formulating beverages using high oil-load emulsions

• High oil loading (up to 50%) offers:
  – Improved stability by being able to use lower dosage levels in your finished beverages
  – More appealing sensory profile
  – Processing efficiencies
  – Lower labor
  – Reduced shipping cost
  – Less inventory/warehousing
# Stability performance comparison

High oil-loading emulsions and their stability performance in a standard beverage

<table>
<thead>
<tr>
<th></th>
<th>12% Oil</th>
<th>30% Oil</th>
<th>40% Oil</th>
<th>50% Oil</th>
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<tbody>
<tr>
<td>Sodium Benzoate (g)</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Quillaja (g)</td>
<td>30</td>
<td>60</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Water (g)</td>
<td>849</td>
<td>639</td>
<td>519</td>
<td>339</td>
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<tr>
<td>Oil Phase (g)</td>
<td>120</td>
<td>300</td>
<td>400</td>
<td>500</td>
</tr>
<tr>
<td>Total (g)</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
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<tr>
<td>Mean PS</td>
<td>.156</td>
<td>.194</td>
<td>.193</td>
<td>.236</td>
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<tr>
<td>Emulsion Stability (over 1 year)</td>
<td>Stable</td>
<td>Stable</td>
<td>Stable</td>
<td>Stable</td>
</tr>
<tr>
<td>Beverage stability</td>
<td>No ringing</td>
<td>No ringing</td>
<td>No ringing</td>
<td>No ringing</td>
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<tr>
<td>Beverage turbidity fresh NTU</td>
<td>212</td>
<td>276</td>
<td>308</td>
<td>318</td>
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</table>
Clear beverages: formulation challenges

- Achieving crystal-clear beverages
- Delivering oil-soluble flavors and actives while maintaining clarity
- Creating a long-term stable emulsion
- Eliminating weighting agents in order to achieve clarity
LABELING and REGULATORY STATUS
Regulatory – US

• Approved for use as a natural or artificial flavoring substance and adjuvant in food and beverages by the FDA under 21 CFR 172.510 and 172.515.

• FEMA GRAS number 2973

• Self-affirmed GRAS by Ingredion Incorporated to expand use as an emulsifier or encapsulation agent in:
  – Flavor concentrates, beverage products, chewing gum, gravies and sauces, snack foods, soups and soup mixes, and dietary supplements.

• Q-Naturale® 300 certified organic
Labeling- US

• **Sale as an ingredient:** quillaja, quillaja extract

• **As part of a flavor sold to a food manufacturer (not a consumer product):**
  
  – Declare each flavor ingredient (including quillaja) by its common or usual name in descending order of predominance

  – In cases where the flavor contains a solely natural flavor(s), the flavor shall be labeled e.g., “strawberry flavor” or “natural strawberry flavor”. If the flavor contains both a natural and artificial flavor, the flavor shall be labeled, e.g., “natural and artificial strawberry flavor”.
Q-Naturale – Quillaja Saponin Benefit Summary

• It is Natural and sustainable
• High oil load – up to 50%
  – It can be used for clear beverages
  – Can be used in alcoholic beverages
• Can be used to simplify your label by removing “weighting agents”.
• Consistent Quality
• Liquid for ease of handling
Regulatory – Canada and Mexico

Canada

- Currently only Type 1 (foam stabilizer) permitted
- Ingredion Incorporated has petitioned Health Canada to expand approval to include Quillaja Type 2 for emulsification and encapsulation in food and beverage categories identical to those in the U.S.
- Both Type 1 (foaming stabilizer) and 2 (emulsification) listed on the Health Canada Natural Health Products list for use in dietary supplements.

Mexico

- Permitted as an emulsifier and foam stabilizer
- Use limitation for some categories, otherwise follow Codex, EU, US, Canada regulations.
Thank You