Chr Hansen Natural Colors

A brilliant red alternative to carmine

Clean Label Conference March 26-27, 2019
S. Frecker
Content

1. Giving consumers the minimally processed colors they are asking for
2. Solving some of the major challenges with natural red colors
3. Securing sustainable supply
4. Introducing our bright red vegetable juices with unique coloring properties
A red like no other

- Unique blend of sweet potato and other red vegetables
- Can replace radish which is known to develop off-flavor in food and beverages over time
- Solves the challenge of pH sensitivity in some applications
- Excellent carmine alternative and Allura red/Red 40 replacer in a broader pH spectrum than other reds

FruitMax® clean, simple and natural

A new addition to our FruitMax® range consisting of minimally processed fruit and vegetable juice that meet consumers’ need for natural recognizable ingredients.
Solving some of the major challenges with natural red colors
A new vibrant red vegetable juice with unique coloring benefits
Despite multiple sources, natural reds are challenging
Examples of natural sources of red shades and their technical constraints

<table>
<thead>
<tr>
<th><strong>Red carmine</strong></th>
<th><strong>Beet</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>matches Red 40/Allura red, but is not vegetarian or aluminium-free</td>
<td>has low process and shelf life stability and is often too pinkish</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Red radish</strong></th>
<th><strong>Aronia</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>matches Red 40/Allura red and has good stability, but has high off-flavor</td>
<td>has a relatively low heat and shelf stability and turns bluish and dull at neutral pH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Black carrot</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>has fairly good stability and low off-flavor, but is often too pinkish and turns bluish and dull at neutral pH</td>
</tr>
</tbody>
</table>
Red FruitMax® based on blends with sweet potato

Unique characteristics:
- Attractive bright red or pink shade dependent on food matrix
- Excellent alternative to carmine, Red 40/Allura red, red radish and red beet
- Good heat and light stability
- No off-flavor
- Less pH sensitive than other red anthocyanin-based fruit and vegetable concentrates. Provides a strawberry red shade at neutral pH where others turn greyish
- Cost efficient
- Resistant to oxidation
Securing sustainable supply
Chr. Hansen’s Approach to Clean Label Color Solutions

**Agronomy**
- Transfer of technology to farmers
- Agronomic trials
- Unique Chr. Hansen’s crops

**Selection**
- Careful natural selection
- Identify genotypes
- Screen for color and yield, in literature and trials

**Breeding**
- Global, multipolar sourcing network
- New phenotypes
- Selection and multiplication of crops with high color content

**Extraction**
- R&D optimizes extraction methods improving color yield

**Formulation**
- R&D improves formulation & yield
- Blending of anthocyanins improves stability

**Application**
- Global reach through Global Expertise Centers by region and multiple local RACs
Ensuring a sustainable supply by controlling the supply chain

- Experience working with products made of sweet potato and sweet potato blends
- Custom-built factory for processing sweet potato tubers
- Extensive knowledge in sweet potato agronomy
- Long-term engagement with experienced sweet potato farmers
- All-year crop means we can adjust planted area monthly to meet increasing demand
Bright red vegetable juice with unique coloring properties
FruitMax® Red 107 WS

A minimally processed blend of sweet potato and black carrot concentrate providing a bright red or pinkish red in multiple food products dependent on the food matrix

Key benefits
- Unique bright red shade
- Minimally processed/Coloring foodstuff
- Heat and light stable
- Flavor neutral
- Less pH sensitive than other anthocyanin based reds
- High strength

Product overview

<table>
<thead>
<tr>
<th></th>
<th>FruitMax® Red 107 WS</th>
</tr>
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<tbody>
<tr>
<td>Source</td>
<td>Sweet potato concentrate and black carrot concentrate</td>
</tr>
<tr>
<td>GIN</td>
<td>718832</td>
</tr>
<tr>
<td>Strength</td>
<td>9 CU</td>
</tr>
</tbody>
</table>
| Shelf-life           | 183 days
                      | 4 - 8°C / 39 - 46°F                                       |
| Labeling             | EU: “Sweet potato concentrate, black carrot concentrate” |
                      | US: “vegetable juice (color)”; “colored with vegetable juice” |
                      | or "color added"                                          |
                      | Codex: “Sweet potato concentrate, black carrot concentrate” |
                      | China: N/A                                                |
| Dietary status       | Kosher & Halal certifiable, vegetarian                    |
**FruitMax® Red 108 WS**

A minimally processed blend of sweet potato and black carrot concentrate and apple juice. It provides a bright red or pinkish red in multiple food products dependent on the food matrix.

**Key benefits**
- Unique bright red shade
- Minimally processed/Coloring foodstuff
- Heat and light stable; flavor neutral
- Less pH sensitive than other anthocyanin based reds
- Containing only natural ingredients

**Product overview**

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<td><strong>Source</strong></td>
<td>Sweet potato concentrate and black carrot concentrate</td>
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<td><strong>Dietary status</strong></td>
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</table>
Icing sugar and sponge cake

**FruitMax® Red 107 WS**
Sweet potato + black carrot

- 0.2%
- 0.3%

**FruitMax® Red 107 WS**
Sweet potato + black carrot

- 2.7%
Icing sugar and sponge cake

FruitMax® Red 108 WS
Sweet potato + black carrot

0.2%  0.3%

FruitMax® Red 108 WS
Sweet potato + black carrot

2.7%
Jelly gums and hard boil candy

**FruitMax® Red 107 WS**
Sweet potato + black carrot

0.25%  
0.5%

**FruitMax® Red 107 WS**
Sweet potato + black carrot

0.25%  
0.5%
Jelly gums and hard boil candy

FruitMax® Red 108 WS
Sweet potato + black carrot

- 0.25%
- 0.5%

FruitMax® Red 108 WS
Sweet potato + black carrot

- 0.25%
- 0.5%
Chocolate dragees and Jelly beans

FruitMax® Red 107 WS  
Sweet potato + black carrot

2.5%  5.0%

FruitMax® Red 107 WS  
Sweet potato + black carrot

3.5%  7.0%
Chocolate dragees and Jelly beans

FruitMax® Red 108 WS
Sweet potato + black carrot

2.5% 5.0%

FruitMax® Red 108 WS
Sweet potato + black carrot

3.5% 7.0%
Water ice

FruitMax® Red 107 WS
Sweet potato + black carrot

0.1%

0.2%
Water ice

FruitMax® Red 108 WS
Sweet potato + black carrot

0.1%

0.2%
Fruit preparation for yogurt

FruitMax® Red 107 WS
Sweet potato + black carrot

0.058% in final yogurt
Fruit preparation for yogurt

FruitMax® Red 108 WS
Sweet potato + black carrot

0.063% in final yogurt
Key takeaways

A bright red like no other

- Unique bright red shade
- Minimally processed vegetable juice
- Heat and light stable
- Flavor neutral
- Less pH sensitive than other anthocyanin based reds
  Simple labelling that meet consumer expectations for clear, recognizable ingredient information.

Ensuring a sustainable supply

- Experience working with sweet potato
- Custom built factory to process sweet potato tubers
- Long-term engagement with experienced potato farmers
- All-year crop means we can adjust planted area monthly to meet increasing demand
We offer a full range of Coloring Foods

<table>
<thead>
<tr>
<th>Pumpkin</th>
<th>Elderberry</th>
<th>Black carrot</th>
<th>Spirulina</th>
</tr>
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<tbody>
<tr>
<td>Safflower</td>
<td>Red beet</td>
<td>Aronia</td>
<td>Burnt sugar</td>
</tr>
<tr>
<td>Orange carrot</td>
<td>Radish</td>
<td>Grape</td>
<td>Malt</td>
</tr>
<tr>
<td>Hibiscus</td>
<td>Sweet potato</td>
<td></td>
<td></td>
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We offer a full range of minimally processed

- Pumpkin
- Elderberry
- Sweet potato
- Spirulina
- Orange carrot
- Red beet
- Black carrot
- Burnt sugar
- Hibiscus
- Radish
- Grape