Application Brief: Colorants in Frozen Desserts

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NATURAL COLORS IN FROZEN DESSERTS

- Natural colors from fruits, vegetables and edible plants processed with only water

- Currently regulated in the USA by:
  - Title 21 CFR, Part 73, Section 73.250 (fruit juice)
  - Title 21 CFR, Part 73, Section 73.260 (vegetable juice)
  - Title 21 CFR, Part 73, Section 73.530 (spirulina)

- Spirulina is currently permitted for use in
  - Ice cream and frozen desserts
  - Dessert coatings and toppings
  - Yogurts
NATURAL COLORS IN FROZEN DESSERTS

NATURAL COLORS CAN BE DIVIDED INTO DIFFERENT CLASSES BASED ON THE ORIGIN OF THE COLOR

• **Anthocyanins (black/purple carrot, purple sweet potato, radish, fruits, berries)***
  - Pink-Red-Purple colors
  - pH sensitive (pH≤4 works well)

• **Beet-based colors***
  - Red color
  - Not pH sensitive
  - Fairly heat sensitive

• **Carotenoids (orange carrot, pumpkin)***
  - Yellow and orange colors
  - Not pH sensitive

• **Spirulina***
  - Blue and green colors
  - pH sensitive (pH>5 works well)

• **Safflower (also called carthamus)***
  - Yellow color (*Not permitted for use in the USA – OK for Canada/LATAM/EU*)
  - Not pH sensitive
NATURAL COLORS IN FROZEN DESSERTS

GROWING COLORS

Spirulina Color
Safflower/ Spirulina Color
Paprika Color
Orange Carrot Color
Radish/ Carrot Color
Purple Sweet Potato Color
Beet Color

THESE FACTORS ARE CRITICAL FOR ICE-CREAM:

- **pH:** Anthocyanin-based color will shift to more blue hue in neutral pH.
- **Fat content:** The more fat content, the more pastel the colors look.
- **Aeration:** The more aeration, the more pastel the colors look.
- **Processing:** Color withstand HTST, UHT should be avoided.
- **Color addition:** Delivery through a syrup after ice cream processing will give more vibrant colors.
- **Taste:** Certain colors impart taste to the product.
**NATURAL COLORS IN FROZEN DESSERTS**

**THESE FACTORS ARE CRITICAL FOR SORBET:**

- **pH:** The lower pH provides more vibrant colors. Spirulina should be avoided.

- **Aeration:** Aeration is typically much lower for sorbets so the colors are less affected.

- **Processing:** HTST is acceptable for most colors. UHT is rarely necessary.

- **Color addition:** Color delivery method plays a much lesser role for sorbets.

- **Taste:** Certain colors impart taste to the product.
# Alternatives to Carmine that Come from Vegetables

<table>
<thead>
<tr>
<th></th>
<th>Carmine (E120)</th>
<th>Beet color</th>
<th>Radish color</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ice Cream</strong></td>
<td><img src="image1" alt="Ice Cream Carmine" /></td>
<td><img src="image2" alt="Ice Cream Beet" /></td>
<td><img src="image3" alt="Ice Cream Radish" /></td>
</tr>
<tr>
<td><strong>Sorbet</strong></td>
<td><img src="image4" alt="Sorbet Carmine" /></td>
<td><img src="image5" alt="Sorbet Beet" /></td>
<td><img src="image6" alt="Sorbet Radish" /></td>
</tr>
<tr>
<td><strong>Yogurt</strong></td>
<td><img src="image7" alt="Yogurt Carmine" /></td>
<td><img src="image8" alt="Yogurt Beet" /></td>
<td><img src="image9" alt="Yogurt Radish" /></td>
</tr>
</tbody>
</table>
Coatings can be a great way to create a colorful experience without changing the appearance of the ice cream

- Fat content
- Oil dispersible colors are needed for incorporation into chocolate
Inclusions can be a fun way to add a vibrant color to a frozen dessert without mixing it with the dairy mix.

- **pH**: No contact with the ice cream so more colors can be used.
- **Processing**: Colors need to be suitable for panning.
NATURAL COLORS IN FROZEN DESSERTS

SUMMARY

- Natural colors are very suitable for frozen desserts
- The origin of the color will dictate its usefulness in a particular product
- Choose carefully and make sure the color works with the formula and the process.
- Natural colors can come in the form of water soluble/dispersible systems, powders or fat dispersible systems
- Color from fruits, vegetables and edible plants meet industry and consumer expectations for a clean label
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