



Natural Carotenes from Carrot



Products, Service and Science you can trust...naturally.™

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Innovation NOW! Forum

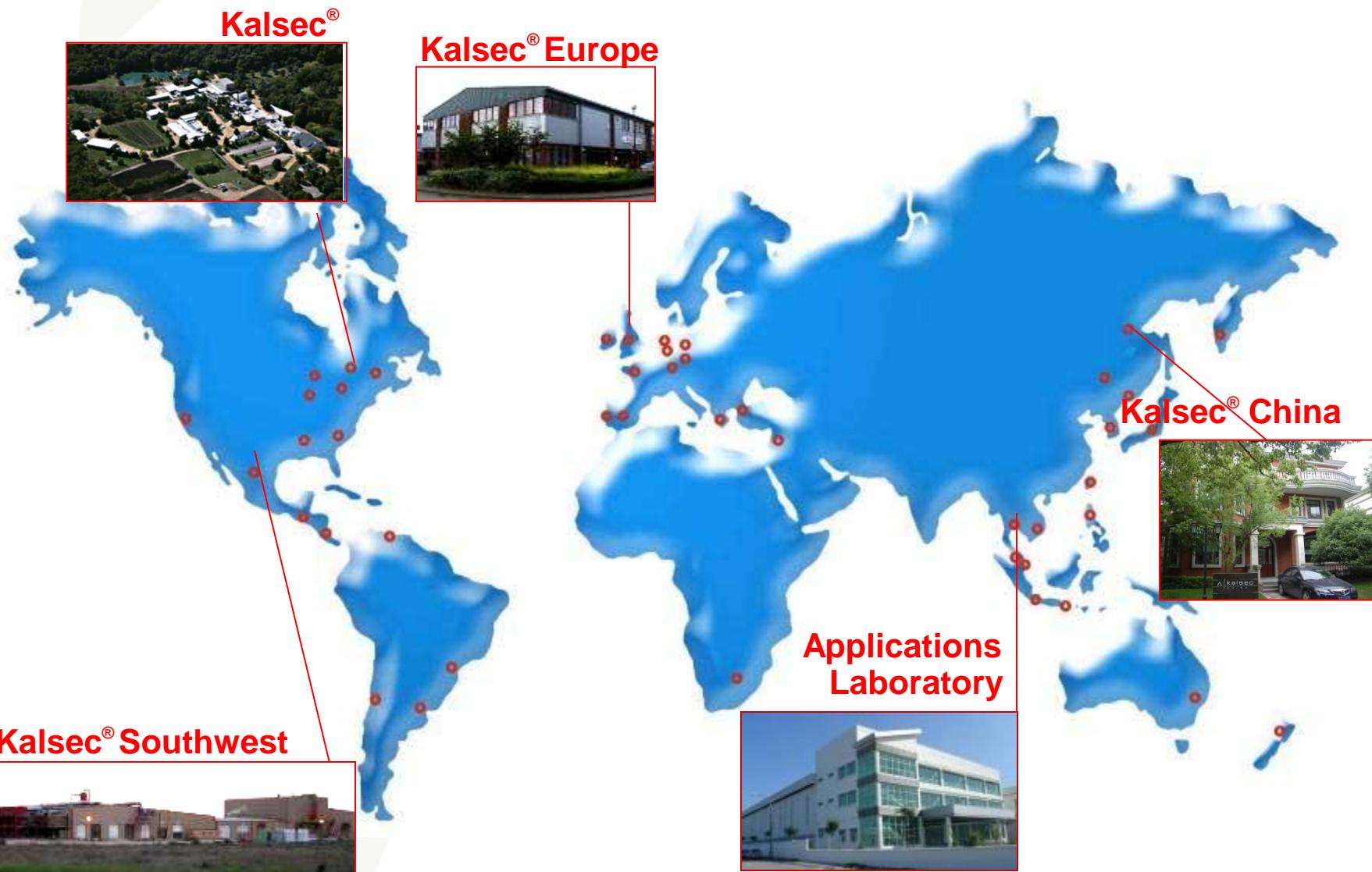
- Kalsec® Overview
- Kalsec® Carrot
- Naturally Derived Colors: Optimizing Your Hue Selection
 - Yellow to Yellowish Orange
 - Product Characteristics
 - Product Offerings
 - Applications and Demos
- Added Benefits of Using Kalsec® Colors
- Q&A

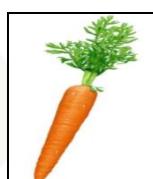
For more than 50 years, Kalsec® has been delivering:

- Products derived from natural herbs, spices, vegetables and hops
 - Highest quality and consistency available in the industry
- Service rooted in a dedication to deliver the best products, on time.
 - Backed with technical expertise that sets us apart from the competition
- Science founded on a commitment to take what nature has provided to create products that deliver exceptional value to you

Products, Service and Science you can trust... naturally.®

Kalsec® Worldwide/38 Sales Offices Globally





- **Natural Spice and Herb Flavor Extracts**
 - The industry leader in the extraction of the highest quality natural herbs, spices and vegetables that are backed with unparalleled customer service and technical expertise to deliver standardized performance and consistent flavor
- **Natural Antioxidants**
 - The market leader for natural antioxidants with standardized performance, relevant product forms, reliable supply, technical support and value-based pricing.
- **Encapsulated Products**
 - E2™ Encapsulated Extracts are ideal for delivering flavor profiles that can be challenging to handle, including: Mustard, Black Pepper, Horseradish, Capsicum, and Wasabi
- **Nutritional Ingredients**
 - Providing the food and dietary supplement industries with natural extractives from spices, herbs and vegetables; including ZeaGold® Natural Zeaxanthin, Alpha Carotene and Capsaicin Concentrate
- **Hop Extracts**
 - Kalsec® specializes in providing the brewing industry with advanced hop extracts for bittering addition, light stability, foam enhancement, and improved economics. HopRival® natural hop extracts are available to provide flavor and aroma that rival traditional hopping
- **Natural Sourced Colors**
 - A full range of natural colors from yellow to orange to pink to red to purple hues. Derived from annatto, turmeric, anthocyanins, paprika, **carrot** and blends of these pigments.

- The color of a food or beverage often determines consumer acceptance or rejection of the product
- Color can extend shelf-life and encourage acceptance
- Added food colors can be temperamental, influenced by many factors
- Keeping attractive stable colors requires a blend of food science, ingredient technology and packaging
- Colors promise sensory attributes - eye power.

- Certified (synthetically produced)
- Exempt from Certification
 - Derived from natural source
 - Synthetically produced carotenoids
- Move to 'natural' in food and beverage
 - Southampton Study*
 - 2011 FDA Meeting
 - Cleaner label movement



*A 2007 study by McCann, et. al. of the University of Southampton, UK.



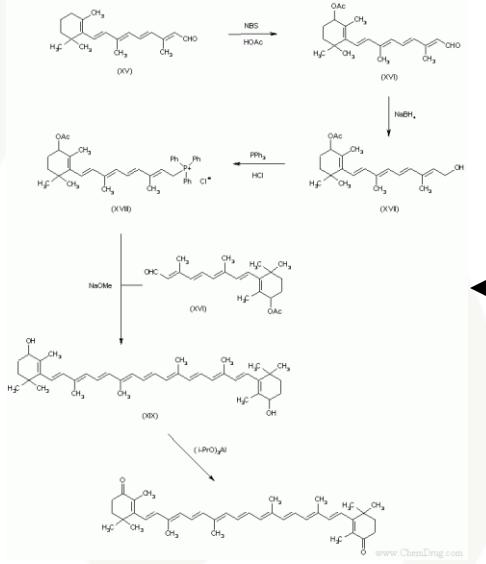
- Kalsec® is the largest global producer of oleoresin carrot food color
- We are vertically integrated with complete control over seed sourcing and production
- Recent substantial investments in crop acreage and state of the art processing equipment to meet the increased market demand
- New product development: carrot emulsions.



- Synthetic (nature identical) beta-carotene is chemically synthesized
- Nature identical formulated to mimic the natural equivalent
- Kalsec® provides food & beverage processors with carrot oleoresin and emulsion products as naturally sourced alternative.

Comparison to Synthetic β -Carotene

- Typical use cost in beverage is \$0.05 to \$0.15 per L at usage rate of 5 to 15 PPM carotenes
- Position as naturally sourced carotenes made from a carrot - a healthy vegetable
- Position for use in new product introductions targeting “clean labels”.



Which is
better
for you?





All colors are not created equal

- How the agricultural levels influence color?
- Colors may not be standardized across different raw material (RM) suppliers
- Effects of different extraction and formulation processes
- RM sourced from different global locations
- Nature's impact on supply.

- Widely held misconception that most natural colors are difficult to use due to their instability
- Critical to work closely with a trusted supplier to find consistent raw materials
- Qualified RM will ultimately influence color, formulation and shelf-life stability of finished products
- Raw material expertise is key:

Knowledge is a key ingredient.

Durabrite® Colors are premium formulations of high stability raw materials and stabilizing systems developed to address the issues of color loss due to oxidative degradation in foods and beverages.

- Paprika
- Annatto
- Anthocyanins
- Carrot



Carrot

- **Hue:** Yellow
 - Similar to FD&C Yellow No. 5



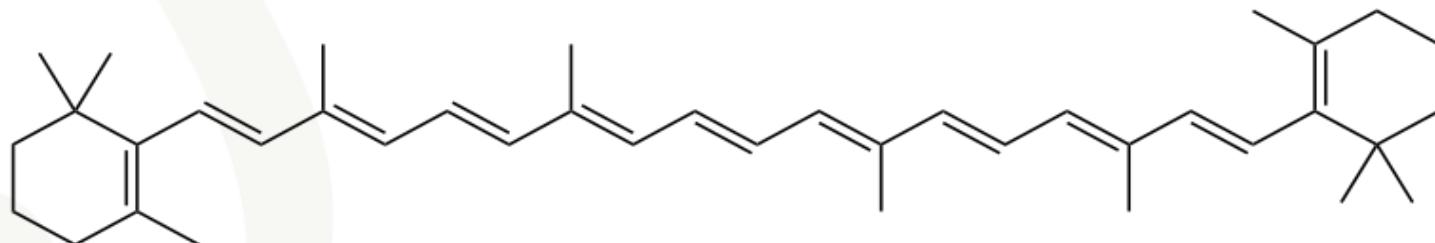
- **Labeling:** “Carrot Extract (Color)”
- **Products:**
 - Oil Soluble: ***Durabrite® Oleoresin***
 - Water Dispersible: ***Durabrite® Aquaresin®***
 - Water Soluble: ***Durabrite®***

Light Stability	Heat Stability	pH range	Comments
Good	Good	Optimum pH range is 3.0-8.0	Ideal replacement for beta carotene and mixed carotenes



Color Emulsions for Aqueous Applications

- Certain high-moisture applications may require an oil-soluble color to achieve the desired hue
- Naturally oil-soluble pigments, can be made into an emulsion that disperses evenly in water
- Formulated to address interaction between oxygen molecules, light and carotenoid colors in aqueous solutions.

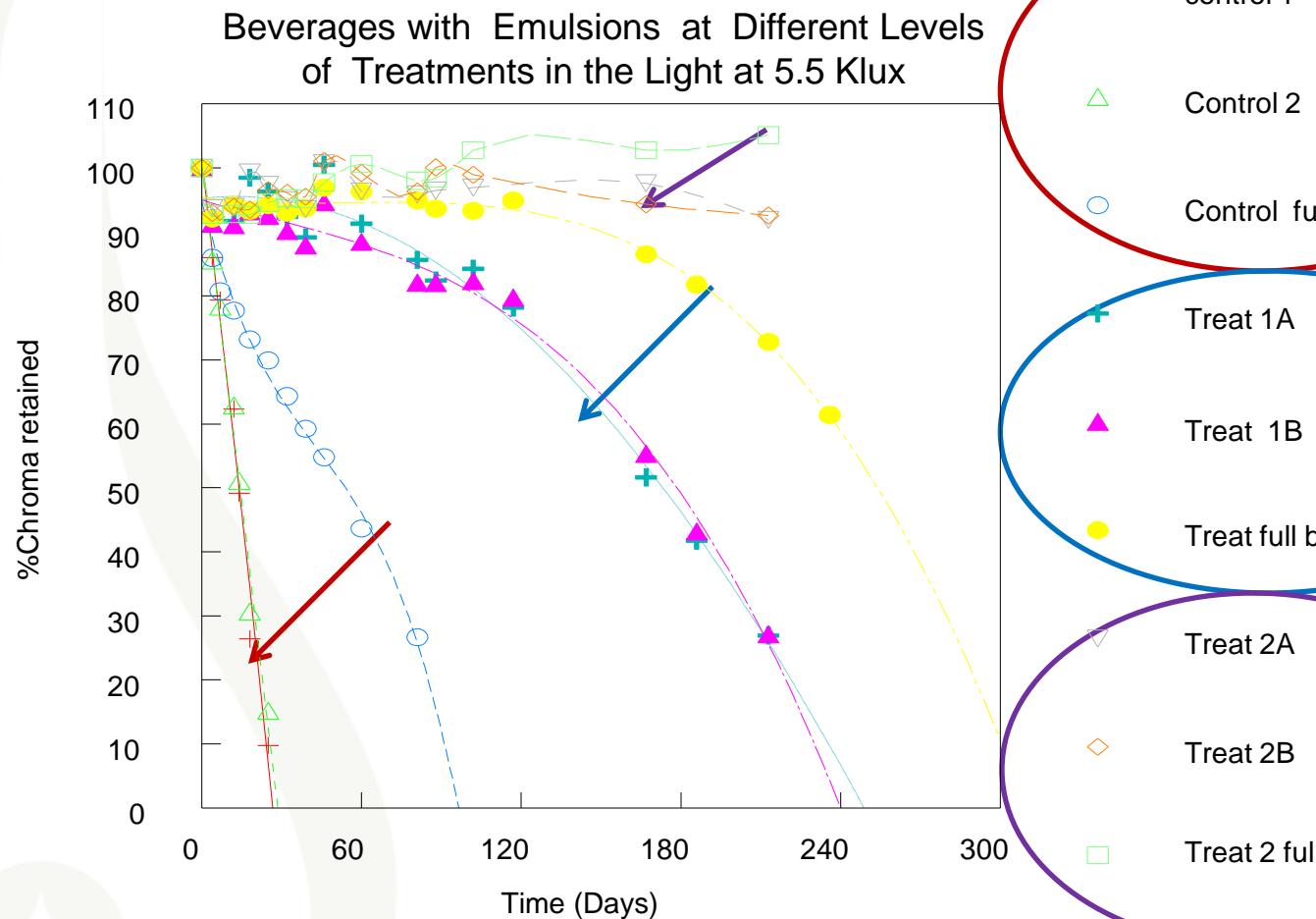


Chemical Structure of Beta Carotene

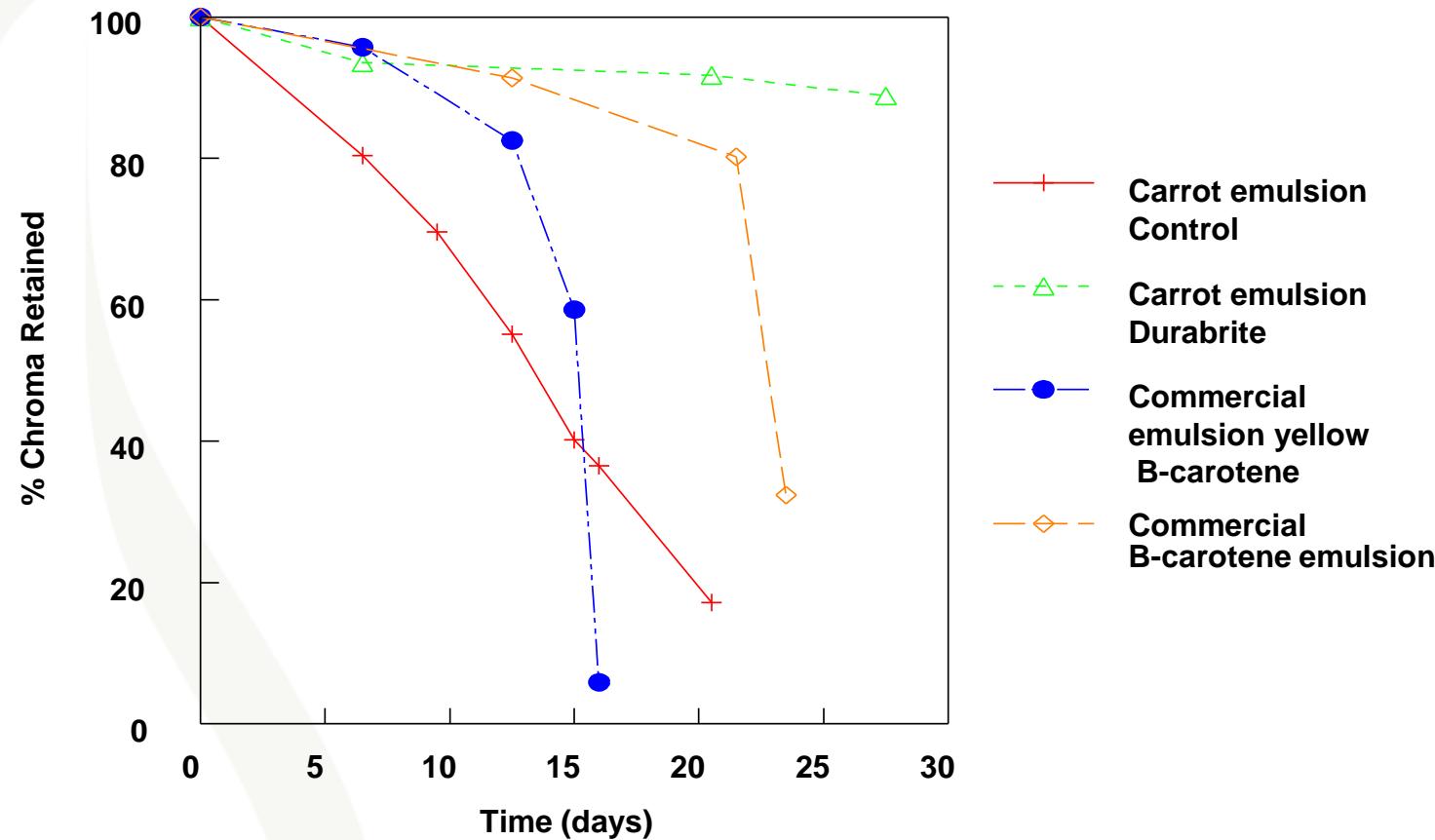
- Carrot and carrot-blend emulsions
- Applications - Cloudy and clear beverages
 - Sauces, dressings, yogurt, etc.
- Physical stability – no ringing
- Light stability – color retention



Light Stability Study of Beverages With Carrot Emulsions



Light Study at 5.5 Klux of Beverages with Carrot and Commercial Beta-Carotene Emulsions



All beverage base were dosed at 10 PPM carotenes and kept at room temperature under lit condition. After ~ 25 d, the commercial samples lost > 70% of color while Kalsec® samples remained stable.

Stabilized Carrot Emulsions

Day 0



Day 14



Day 28



Carrot
Control

Carrot
Treatment
1

Carrot
Treatment
2

Commercial
1

Commercial
2

- Kalsec®'s carrot emulsions offers substantial advantages over synthetic beta carotenes:
 - Superior color stability
 - No ringing/creaming
 - Qualifies for naturally-sourced ingredient
 - Marketing advantage on PDP for natural food & beverages.

- Suitable for food, health and beauty applications
- Mixture of naturally occurring alpha and beta carotenes
- Natural yellow appearance
- Easily blended with paprika and annatto
- Durabrite® formulations – excellent stability
- Improved light stability compared to turmeric
- Clean label.

Application Recommendations

	Oleoressin Carrot 49.03	Carrot Extract 49.06	Durabrite Oleoressin Carrot, WD 49.29	Durabrite Aquaresin Carrot, 1% 49.39.02
Application				
Bakery				
Bakery mixes	0.06 - 0.6%	0.06 - 0.6%		
Bread	0.02 - 0.2%	0.02 - 0.2%		
Cake	0.1 - 0.3%	0.1 - 0.3%		
Coatings and Crumbs	0.2 - 2.0%	0.2 - 2.0%		
Pancake batter	0.01 - 0.04%	0.01 - 0.04%		
Confectionery				
Confectionery			0.02 - 0.1%	
Dairy				
Butter	0.02 - 0.1%	0.02 - 0.1%		
Process Cheese	0.05 - 0.3%	0.05 - 0.3%		
Ice Cream			0.02 - 0.2%	
Yogurt			0.01 - 0.2%	
Fats & Oils				
Chicken fat	0.01-0.06%	0.01-0.06%		
Fats & Oils	0.05-0.2%	0.05-0.2%		
Margarine	0.05-0.2%	0.05-0.2%		
Spreads/Garlic butter	0.05-0.2%	0.05-0.2%		
Soups, Sauces & Condiments				
Chicken soup	0.05 - 0.2%	0.05 - 0.2%		
Dressings			0.05 - 0.5%	0.05 - 0.5%
Mayonnaise			0.004 - 0.02%	0.004 - 0.02%
Mustard	0.12 - 0.24%	0.12 - 0.24%		
Sauces (Hollandaise, Alfredo, etc.)			0.02 - 0.05%	0.02 - 0.05%
Soups			0.05 - 0.5%	0.05 - 0.5%
Dry Blends				
Snack Seasonings		0.2 - 2.0%		
Spray Dried Cheese		0.2 - 2.0%		

Colored Cracker Demonstration

FORMULATION:

AP Flour	60.41%
Shortening	13.49%
Baking Powder	0.87%
Water Color Mixture	25.23%
	100.00%

PROCESSING PROCEDURE:

1. Preheat conventional oven to 375°F.
2. Combine the flour and baking powder. Cut in the shortening until mixture becomes crumbly and gravelly looking.
3. Mix together water and color. Add the water mixture and mix until the dough comes together, kneading to incorporate when mixture becomes too dry to stir.
4. Let dough rest at least 30 minutes or refrigerate overnight.
5. Using pasta roller attachment, run the dough through twice on each setting up to 4. Place rolled dough onto a sheet of foil and cut dough into small squares. Using a toothpick, prick each square in the center. Carefully place foil on baking sheet.
6. Bake in the conveyor oven at 375° F for 10-15 minutes or until crisp, let cool and then package.
7. Optional – lightly coat baked crackers with oil.

Kalsec® Color Code	Product Name	Dosage Rate
49.29	Durabrite® Oleoresin Carrot, W/D	0.25%
49.29 + 02.040.35	Durabrite® Oleoresin Carrot, W/D + Durabrite® Aquaresein® Paprika	0.25% + 0.10%

1. Usage rate = 15 PPM Mixed Carotenes
2. Usage rate = 10 PPM Mixed Carotenes
3. Usage rate = 5 PPM Mixed Carotenes

Other Applications



Liquid Seasonings



Sauces



Ice Cream



Dressings



Yogurt





Sample Ingredient Label:

dextrose, sugar, corn syrup, cornstarch, modified cornstarch, 2% or less of (citric acid, lactic acid, confectioner's glaze, natural flavor, artificial flavor, sodium citrate, gum acacia, mineral oil, carnauba wax, artificial color (Allura red, Quinoline yellow, Tartrazine, blue 1), sulfur dioxide (to maintain freshness), BHT (to maintain freshness)).

Synthetic

Allura red, Quinolone yellow
Tartrazine
BHT

Natural

Anthocyanins, carrot, turmeric, or color blends, Herbalox® natural antioxidant.

Leverage the full Kalsec® natural portfolio.. **Natural Simplified Labels**

Why Use Kalsec® Carrot Colors?

- Vertically integrated
 - Plant
 - Grow
 - Harvest
 - Extract
 - Formulate
- High stability
- Water dispersible
- Acid stable
- Active components can provide health benefits
- Over 50 years experience in shade delivery.

Benefits of Using Kalsec® Colors

- Low Flavor
- Kosher
- Non-GMO
- Halal Availability
- High Stability Yellow, Orange, Pink & Red Hues
- Hue Consistency
- Stable Supply
- Agricultural Assurance
- Raw Materials Evaluation Process
- Color R&D Team



Turmeric



Carrot



Annatto



Paprika



Anthocyanins



Fescue 28

Thanks for Your Attention!!!

