

**Whole Grain Trends:
From Dense to Delicious –
Manufacturers learn whole grain tricks**

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ConAgra Mills™

Factors in the Development of Delicious Whole Grain Foods

- Grain Ingredients – Types and Forms
- Grain Milling Technology
- Supply Chain
- Product Development
 - Experience in working with whole grains
 - Functional/support ingredients

Whole Grain Foods – Early Challenges

- Whole Grain Ingredients
 - Availability
 - Transportation and Storage
 - Ingredient Cost - \$\$
 - Production costs higher

- Whole Grain Products
 - Less experience in formulating products with whole grains
 - Slower product turn
 - Shorter shelf life

- Less consumer push/pull
 - Fewer research studies to create “buzz”
 - Dietary Guidelines did not emphasize whole grain consumption
 - 1980 and 1985 – “Eat foods with adequate starch and fiber.”
 - Nutrition Facts panel

Green Acres Whole Grain “Hotcakes” 1965-1971

- Lisa Douglas’ special whole grain variation - "veatcakes" (wheat stalks pressed into hotcake batter mix)
- Inedible, but handy for farm repairs
- Only enjoyed by Eleanor - the cow



<http://www.tvacres.com/>

Star Trek - Whole Grain “Quadrotriticale” 1966-1969

- Quadrotriticale – a special genetically engineered four-lobed hybrid of wheat and rye – for transport to Sherman's Planet for farming development.
- Tribbles – small soft cuddly pets with voracious appetites and a gestation period of 12 hours.
- Tribble numbers increase to >1.5 million after eating quadotriticale





Need readily available whole grain products across product types and in all markets

- Baked goods (including breads, tortillas, biscuits, muffins, quick breads)
- Snacks – sweet and savory
- Bars (granola, nutritional, fruit & grain)
- Hot & RTE cereals
- Toppings/Stir-ins
- Desserts
- Breaded/battered products
- Vegetarian patties
- Pasta
- Soups
- Side Dishes



Formulating with Whole Grains

- **Grain Ingredient Types and Forms** – choosing the right whole grain(s) for your product applications
- Whole Grain Inclusion levels
- Nutritional deliverables - do you want to make a claim?
- Ingredients not allowed/limited
- Product parameters –
 - Parbaked, ready-to-eat, shelf-stable, etc.
 - Organic, Kosher, Allergens, Gluten Free
- Cost

Grain Ingredients

Grain Types – A Comprehensive List

(recommended to FDA by AACCI Whole Grain Task Force 2006)

➤ Cereal Grains

- Wheat (includes spelt, emmer, farro, einkorn, Kamut®, durum)
- Rice
- Corn (maize, popcorn)
- Oats
- Barley
- Rye
- Canary Seed
- Fonio
- Millet
- Wild Rice
- Triticale
- Sorghum
- Teff
- Job's Tears

➤ Pseudocereal Grains

- Amaranth
- Buckwheat
- Quinoa

Whole Grain Ingredient Considerations

- Grain Type
 - Hard or soft whole wheat; other whole grains; multigrain mixtures
- Grain Seed Color
 - “white”, yellow, tan, red, brown, black, purple
- Particle Size
 - Coarse, medium, fine, ultrafine; cracked, crushed, rolled, etc.
- Nutritional targets
 - Fiber level – insoluble fiber & soluble fiber level and type
 - Protein level & amino acid profile
 - Fat content
- Functionality in product
 - Fiber, protein, fat content; starch granule size
 - Grain processing – toasted, instantized, etc.

Manufacturing Technology

Flour Particle Size

Flour:

- Coarse
- Medium
- Fine
- Ultrafine **
- Microfine



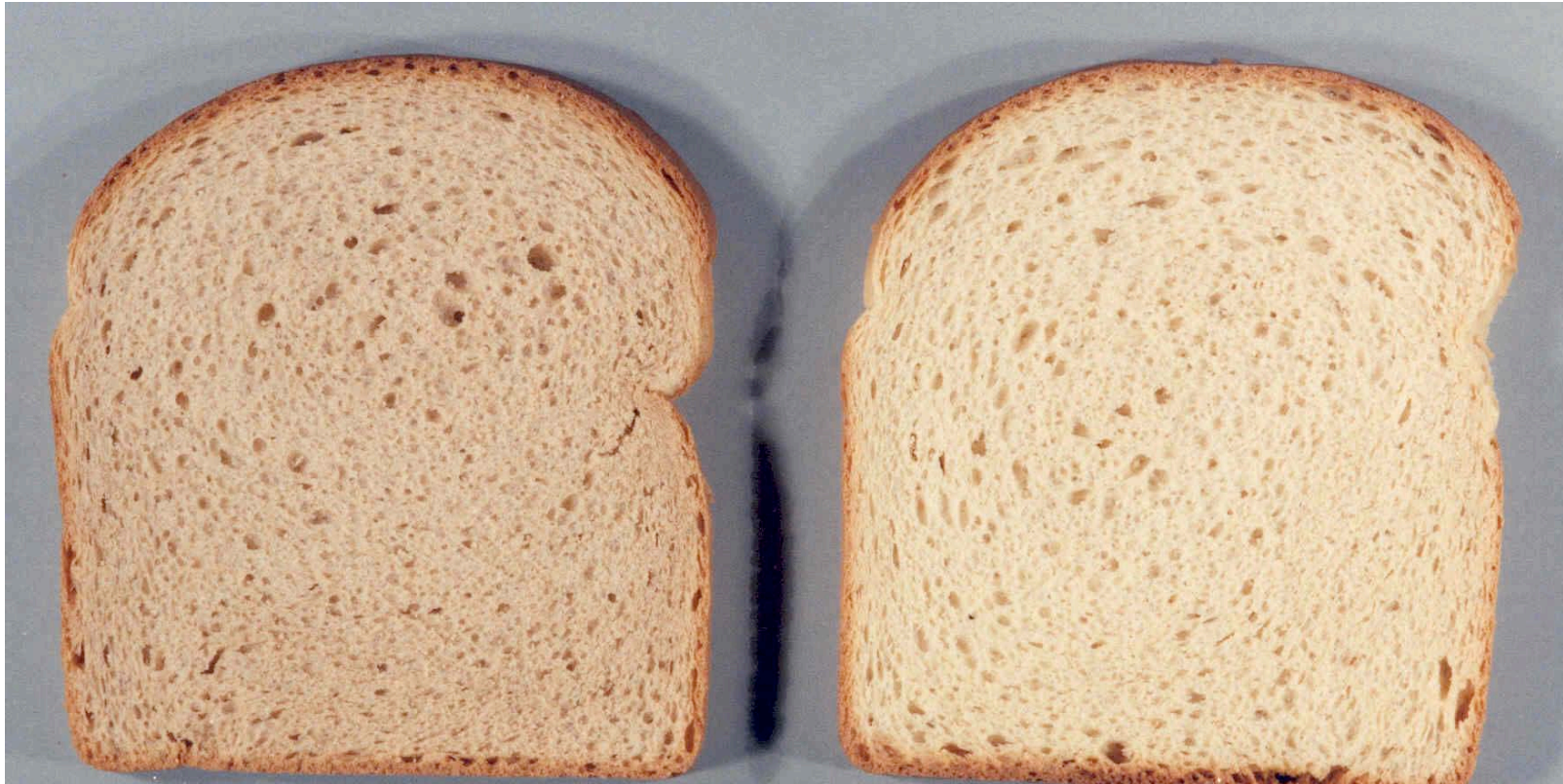
**Ultragrain whole wheat flour

Other Forms:

- Cracked, Crushed,
Chopped, Cut, Rolled

- Same particle size range as refined wheat flour
- Milled from white wheat

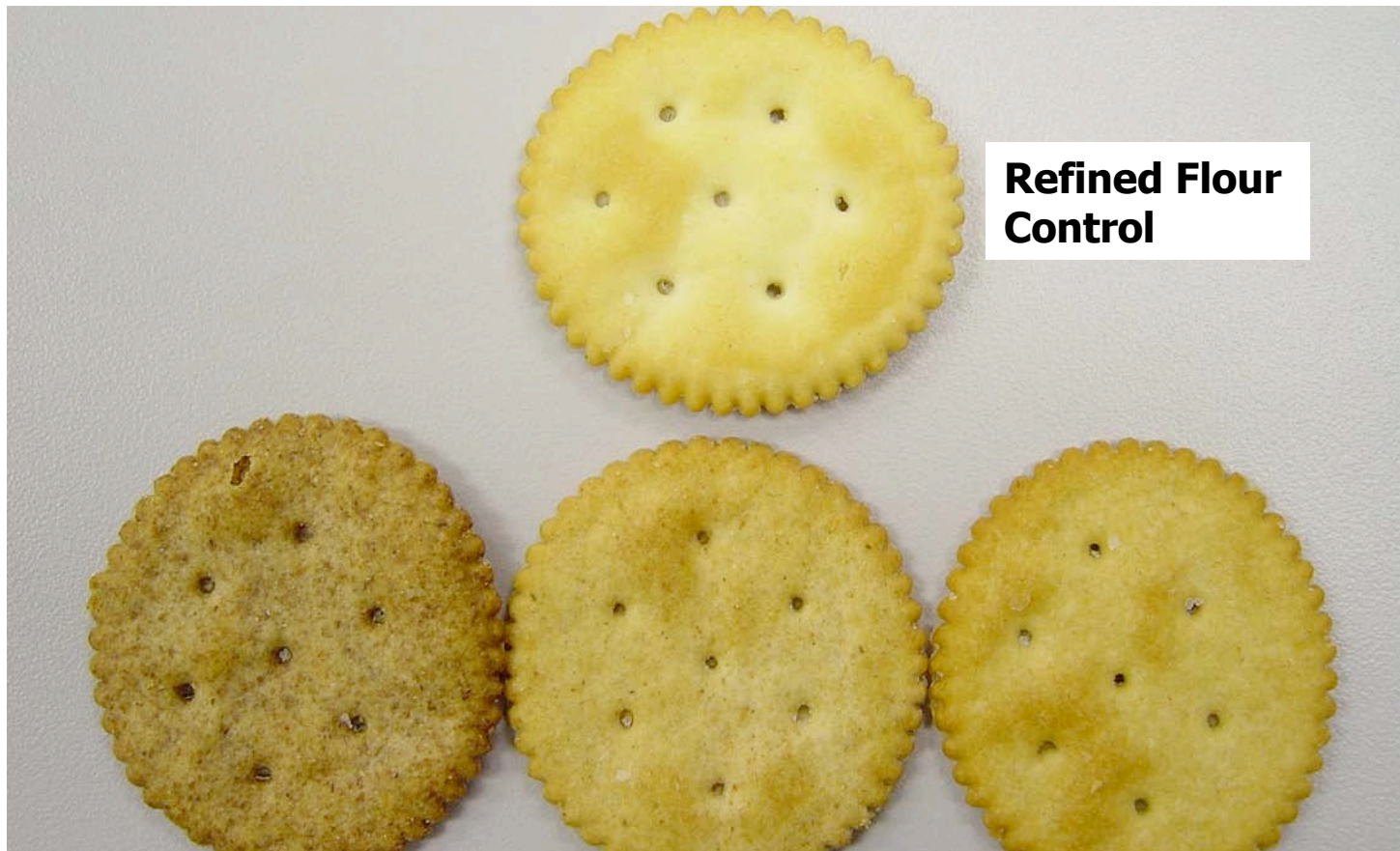
100% Whole Wheat Breads



Ultragrain Red Wheat

Ultragrain White Wheat

Snack Crackers: Effect of Wheat Color and Flour Particle Size



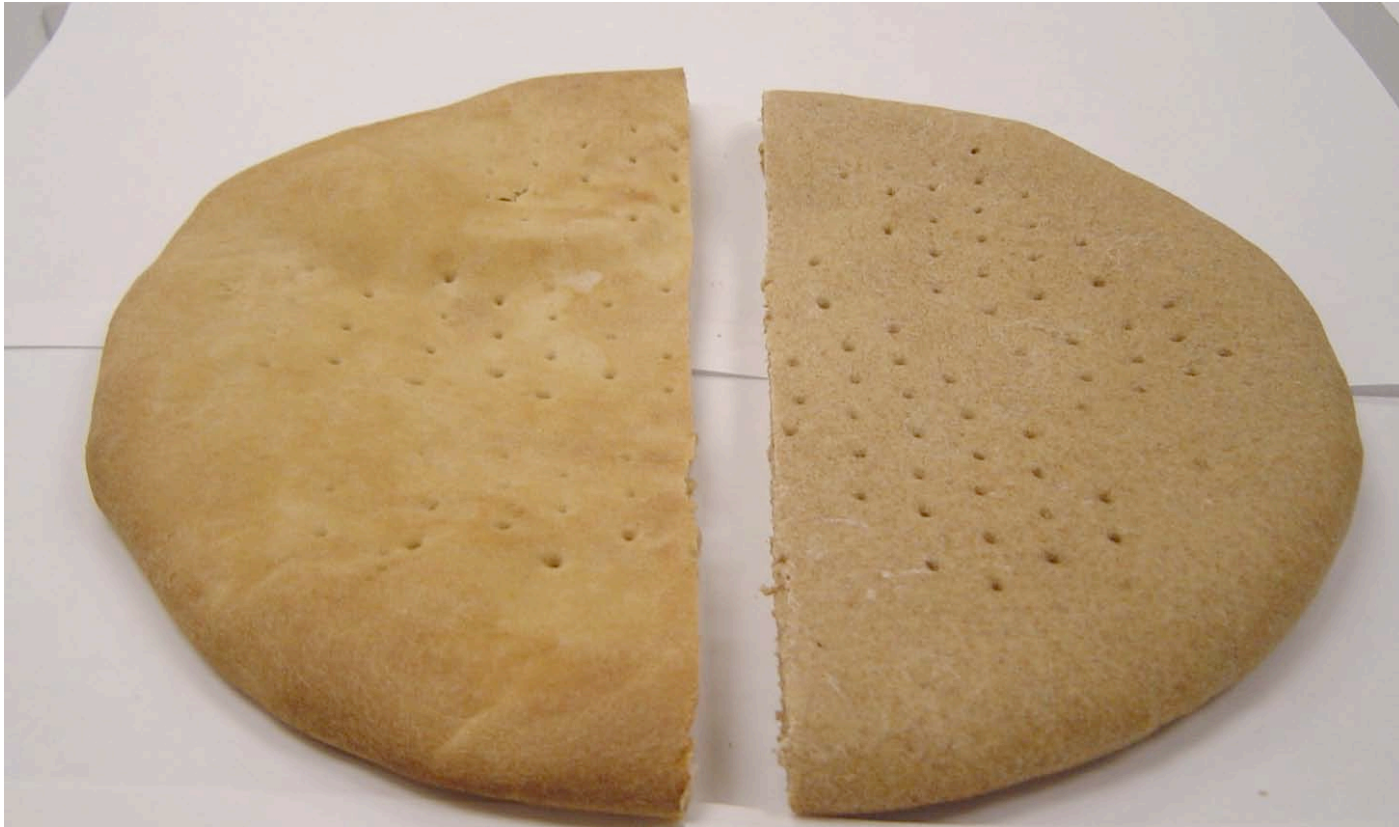
**Refined Flour
Control**

FWW Red

FWW White

Ultragrain® White

Pizza Crust: 100% Whole Wheat



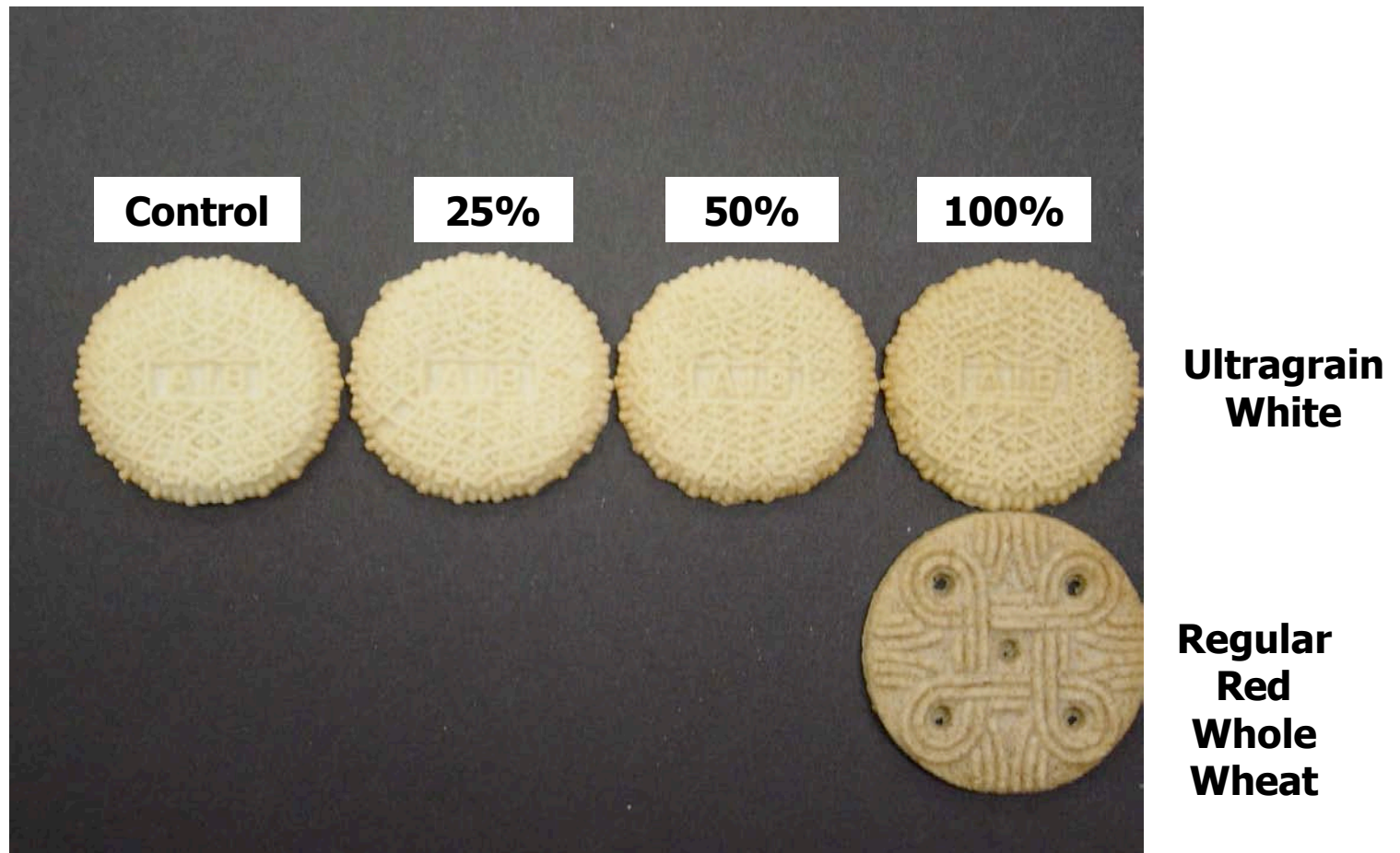
Hard White Winter
Finer P. Size

Hard Red Winter
Standard P. Size

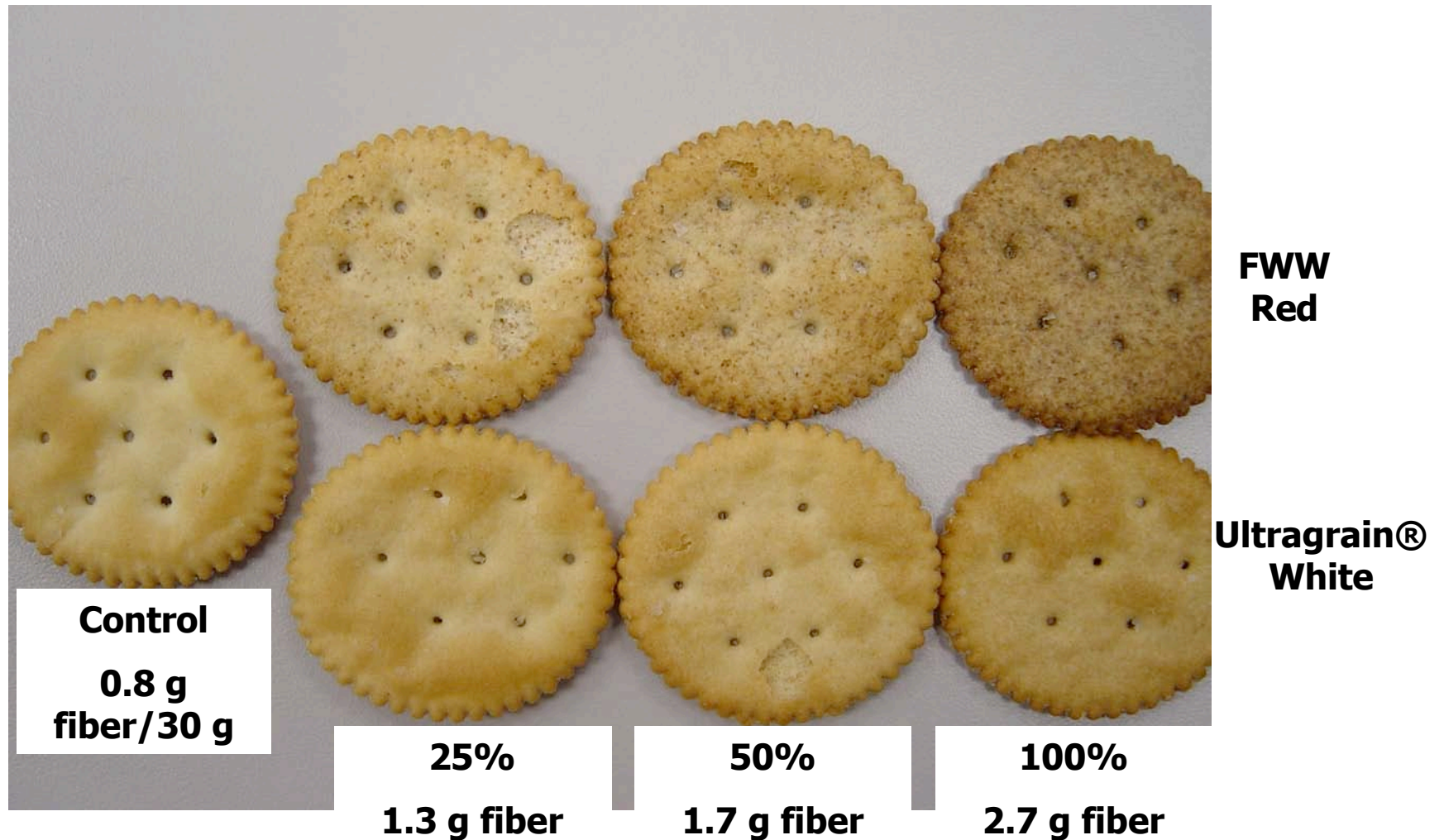
Inclusion Level –

- Partial vs. 100% Whole Grain**
- Nutritional Impact**

Cookies: Effect of Wheat Color, Particle Size and Inclusion Level



Snack Crackers: Effect of Wheat Color and Use Level



Gradual Approach to Increasing Whole Grains

- Gradually incorporate whole grains into foods
 - Make partial whole grain foods-containing whole grains and refined grains
 - Allow consumers time to get used to changes
- Begin with popular items such as pizza crust, tortillas, pasta, buns
- Make stepwise increases over time
- Labeling / Clear communication of benefits

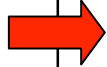


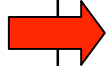
9 g Whole Grain
per 30 g flour



Pizza Crust with Whole Grain Wheat

All are ConAgra Mills estimates

One whole grain ounce equivalent = 16 grams whole grain

Ratio Whole Grain/Refined	Formula % Whole Grain	Whole Grain per 55 g crust	Dietary Fiber per 55 g crust	Claims Examples
0/100	0 	0	0.9 g	-----
25/75	15 	9 g	1.8 g	_ ounce-equivalent of whole grain 9 grams of whole grain per serving
51/49	30 	17.5 g	2.6 g	1 ounce-equivalent of whole grain 17 grams of whole grain per serving FDA Good Source of Fiber FDA Fiber from Grains/Cancer
100/0	57 	33 g	4.2 g	100% Whole Grain Crust 2 ounce equivalents of whole grain FDA Good Source of Fiber FDA Fiber from Grains/Cancer FDA Whole Grains/Cancer & Heart

* Reference Amount Customarily Consumed (RACC) for pizza crust is 55 g baked

Whole Grain Variety to Meet Product Development Needs



Barley Variety with Higher Nutritional Density

- 30% Total Dietary Fiber (12% soluble fiber)
- 18% Protein

5-Whole Grain Flour Blend

- Amaranth
- Quinoa
- Millet
- Sorghum
- Teff



Whole Grain Ingredient Considerations

- Flavor
- Color
- Texture
- Functionality
- Nutrition
 - Macronutrients (fiber, fat, etc)
 - Amino acid balancing
 - Micronutrients & antioxidants
 - Gluten/Allergens
- Shelf Life

- Availability
 - U.S. grown vs. imported
 - Quantities
 - Forms available – seed, flour, flakes, etc.
- Price
- Support Data
 - Nutritional information
 - Testing/certification for allergens, gluten, organic
 - Sanitation and quality programs

Formulating with Whole Grains –

- Processing**
- Functional/Support Ingredients**

Processing

- Inclusion level – minimal inclusion for label appeal vs. 20-30% vs. 51% vs. 100%
- Moisture absorption – whole grains require more water/liquids
- Dough mixing requirements – whole grain doughs require less mixing
- Baking requirements
 - Product color/browning
 - Finished product moisture target
- Ingredient stability and finished product shelf life

Functional/Support Ingredients

- Sweeteners – brown rice syrup, fruit pastes/concentrates
- Fats – trans free hard fats, higher stability oils (example – high oleic sunflower oil)
- Fibers – Oat fibers, resistant starches, inulin, citrus fiber
- Other Functional Ingredients
 - Enzymes
 - Emulsifiers
- Other Nutritional Ingredients
 - Omega-3 fatty acids
 - Vitamins and minerals

Approaches to Increasing Whole Grains

1. Gradual approach - slowly increase whole grain into the product formulation
2. Choice of grain color - use white whole wheat & other lighter-colored whole grains to minimize changes in product appearance
3. Choice of flour particle size to customize product appearance and texture
4. Choice of grain type and mixtures to optimize end product flavor
5. Make 100% whole grain foods more widely available in more types of foods
6. Develop innovative and novel products containing whole grain.

2007 Whole Grain Product Launches





Whole Grain Trends: From Dense to Delicious – Manufacturers learn whole grain tricks

Food products made with whole grain are receiving increased attention, particularly after the 2005 Dietary Guidelines for Americans recommendation to make at least half our grain intake whole grain. Historically, whole grain food products were the exception rather than the norm and were often dark, dense, sometimes dry and not always delicious. Today, food product developers have more ingredient choices to customize the appearance, texture and nutritional value of whole grain foods. Aspects of formulating with whole grains will be discussed, including use of grain ingredient types, inclusion levels, nutritional attributes, functional ingredients for baking and recommended processes. Further increasing the availability of delicious, clearly-labeled foods made with whole grains will help consumers better their health through whole grains.