

Whole Grain Forum

Beijing, China

3rd International Nutrition & Health Industry Expo

The Ingredient 'Wheat Aleurone' and Nutritional Benefits

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Who we are....

- Provider of food, agricultural and risk management products and services
- Global organization: 160,000 employees in 67 Countries
- Our purpose is to be the global leader in nourishing people
- Our mission is to create distinctive value for our customers
- The Bakery Category works across our ingredient businesses to identify key consumer trends and customer needs to develop innovative new products

Outline

- > Role of whole grain components in US marketplace
- > Nutritional comparisons
- > Aleurone definition
- > Applications
- > Challenges and Opportunities

Endosperm

- 90-95% of wheat flour in the US
- Major portion of the wheat kernel
- Typically enriched with B vitamins and iron
- Processing benefits
- Acceptability
- Versatile applications



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Wheat Germ

- The “heart” of the wheat kernel
- Vitamin E, Folic Acid, Phosphorus, Thiamin, Zinc, Magnesium
- Nutty sweet flavor
- Versatile applications



Bran

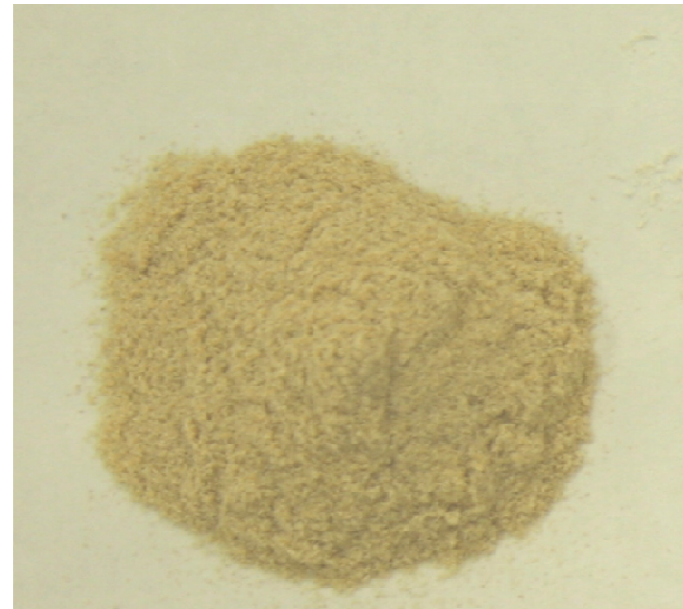
- Nutrient dense
- Public awareness of nutritional benefits
- Phenolic compounds
- Cereals, baked goods, snacks
- Affects processability in some applications at high levels



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Wheat Bran Fractionation

- Consists of the aleurone layer, starch, and pericarp
 - Contains 45-55TDF
 - Concentrated source of essential vitamins, including B6, niacin and E
 - Concentrated source of important minerals such as potassium, magnesium, calcium, iron and zinc
- Includes most major antioxidants, and many phytochemicals



Wheat Aleurone and Bran *Macronutrients*

Concentrated Aleurone vs. Wheat Nutritional Comparison		Concentrated Aleurone	Source Wheat Bran
<i>Proximates</i>			
Moisture	%	8.14	12.76
Ash	%	7.34	5.38
Protein	%	17.46	16.31
Starch	%	12.75	17.34
Total Dietary Fiber	%	43.36	40.67
Insoluble	%	40.15	38.50
Soluble	%	3.07	2.48
Total Fat	%	6.33	5.40

Source: USDA Nutrient Database
 Cargill Incorporated
 Data/GrainWise

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Wheat Aleurone and Bran *Micronutrients*

Concentrated Aleurone vs. Wheat Bran		Concentrated Aleurone	USDA Wheat Bran
Nutritional Comparison			
<i>Minerals</i>			
Fe-Iron	mg/100g	13.93	10.57
Mg-Magnesium	mg/100g	770.00	611
P-Phosphorus	mg/100g	1857.00	1013
K-Potassium	mg/100g	1780.00	1182
Zn-Zinc	mg/100g	12.05	7.27
Cu-Copper	mg/100g	1.35	0.998
Mn-Manganese	mg/100g	12.70	11.5
<i>Vitamins</i>			
Thiamin (B1)	mg/100g	1.26	0.523
Riboflavin (B2)	mg/100g	0.32	0.577
Niacin	mg/100g	22.87	13.58
Pantothenic acid	mg/100g	1.87	2.18
B6	mg/100g	2.52	1.3
Folate	mcg/100g	220.33	79

Source: USDA Nutrient Database
Cargill Incorporated
Data/GrainWise

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Prebiotic Study

Concentrated Aleurone vs. Bran

- Aleurone shown to be better prebiotic than wheat bran
- Dietary fiber in aleurone is preferentially degraded

Amrein, T.M.; Granicher, P.; Arrigoni, E.; Amado, R.; “In-vitro digestibility and colonic fermentability of aleurone from wheat bran”, *Lebensmittel-Wissenschaft und Technologie* 36(4), 451-460, (2003)

Stevens, Barry J.H. & Selvendran, Robert R; “Changes in Composition & Structure of Wheat Bran Resulting from the action of Human Faecal Bacteria in vitro” *Carbohydrate Research*, 183, 311 – 319 (1988)

Heller, S.N. et al; “Dietary Fiber: the effect of particle size of wheat bran on colonic function in young adult men”; *American J. of Clinical Nutrition* 33, 1734-1744 (1980)

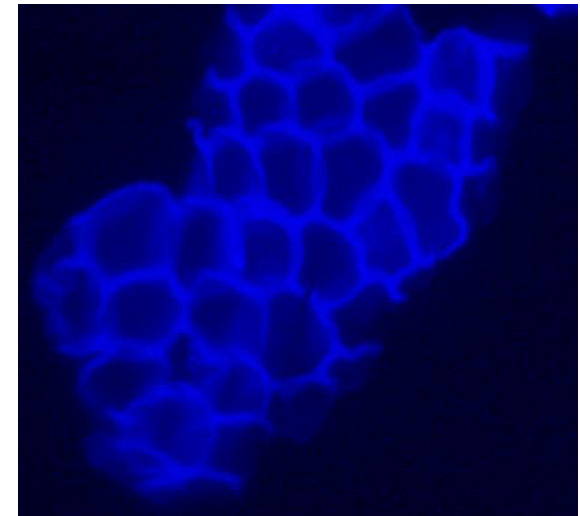
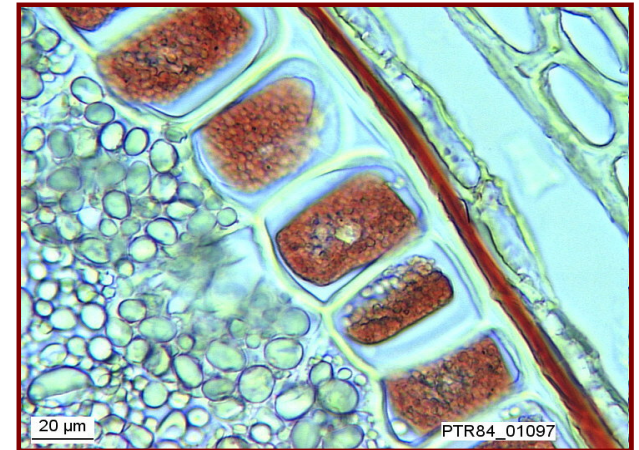
Van Dokkum; Pikaar, N.A.; Thissen J.T.N.M.; “Physiological effects of fibre-rich types of bread” *British J. of Nutrition* 50, 61-74 (1983).

Aleurone definition – AACCI Aleurone Task Force – Developed and Approved 2010

“Cereal aleurone tissue comprises the outermost layer(s) of the endosperm in cereal grains, and surrounds the starchy endosperm and part of the embryo. Cereal aleurone tissue is separated from the germ and starchy endosperm by standard milling practices, starting with the grain kernel or starting with the bran, followed by further extraction processes. Microscopic evaluation reveals that aleurone cells are morphologically distinct from other grain tissues because they contain a high concentration of niacin bodies. Each aleurone cell is enclosed within a fibrous cell wall that is thicker than endosperm cell walls and that is composed mainly of arabinoxylans and beta glucans in various ratios. Isolated aleurone tissue should contain low levels of starch and pericarp, and represents a major portion of the grain’s physiologically beneficial substances for human nutrition.”

The Aleurone Layer

- > White paper written to support nutritional benefits of aleurone
 - Joanne Slavin and Gary Fulcher
 - “In wheat, the majority of desirable “whole grain” components are concentrated in the aleurone layer, the primary component of bran which is source of antioxidants, minerals, lysine-rich proteins, soluble and insoluble fiber, water- and fat-soluble vitamins, sterols and lignans, among others...The aleurone layer is not only unique – it is the primary source of bioactive effects conferred by whole wheat products; indeed it is the core of whole wheat benefits.”



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FOOD APPLICATION EXAMPLES

Bread

- 20% Concentrated Aleurone:80% Enriched White Flour = Whole Wheat nutrition
- Processability, texture, flavor, similar to a white bread

Nutritional Comparison		Enriched White flour	*Whole Wheat flour	20% Aleurone flour
Protein	%	12.20	14.20	13.40
Fiber	%	2.00	9.70	11.30
Insoluble	%	1.40	8.70	10.00
Soluble	%	0.60	1.00	1.30
Vitamins				
B6	mg/100g	0.10	0.64	0.47
Niacin	mg/100g	3.92	2.19	9.21
Minerals				
Ca	mg/100g	16.30	30.60	37.20
Mg	mg/100g	29.40	138.00	156.00
Zn	mg/100g	0.71	2.65	2.24
K	mg/100g	109.00	333.00	405.00
Ash	%	0.48	1.50	1.83
Total Carbohydrates	%	72.10	62.10	61.50
Fat	%	1.63	2.52	2.66
Moisture	%	12.20	11.00	10.60
Whiteness (L.A.B.)	L-Value	97.55	80.26	90.95



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Cereal

➤ Flakes

- 35% Concentrated aleurone
 - Whole wheat flour, barley flour, and white flour
- Excellent source of:
- Fiber
- Two essential antioxidants (manganese and selenium)
- Phosphorus
- Magnesium
- Good source of:
- Iron
- Thiamin
- Niacin
- Vitamin B6
- Copper
- Natural Enrichment
- Nutty flavor
- Earthy appearance
- Firm snap



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Cereal

- > Clusters
 - Blended with corn sweetener for binding syrup
 - Tender bite
 - Not sticky
- > Granola
- > Rice cakes



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Snacks

➤ Extruded Snacks

- 35% Concentrated aleurone
 - Whole grain corn flour, water
- Excellent source of:
- Fiber
- Phosphorus
- Magnesium
- Good source of:
- Niacin
- Vitamin B6
- Copper
- Bland flavor
- Good crunch



Protein Bar

➤ High Protein Bar

- 20% Concentrated aleurone
 - Soy protein, whey protein, peanut flour
- Excellent source of:
- Vitamin E
- Copper
- Good source of:
- Fiber
- Protein
- Niacin
- Phosphorus
- Magnesium
- Soft texture
- Good cohesiveness
- Nutty flavor



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Miscellaneous Applications

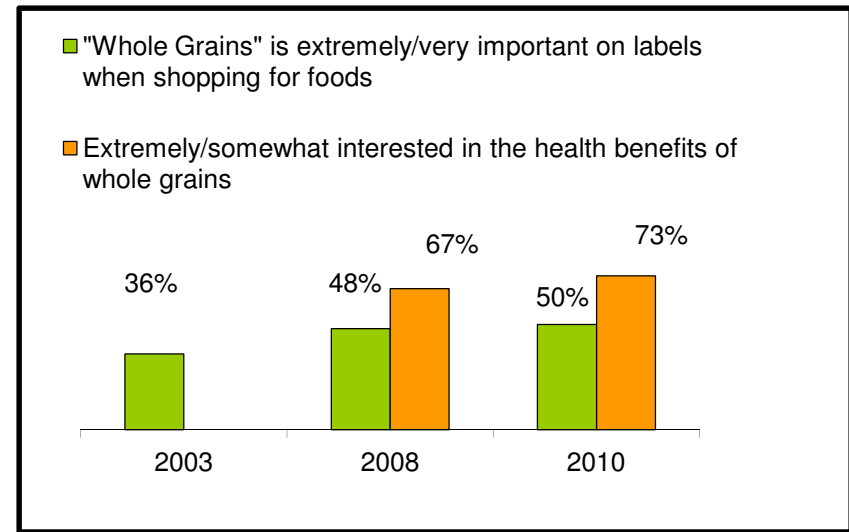
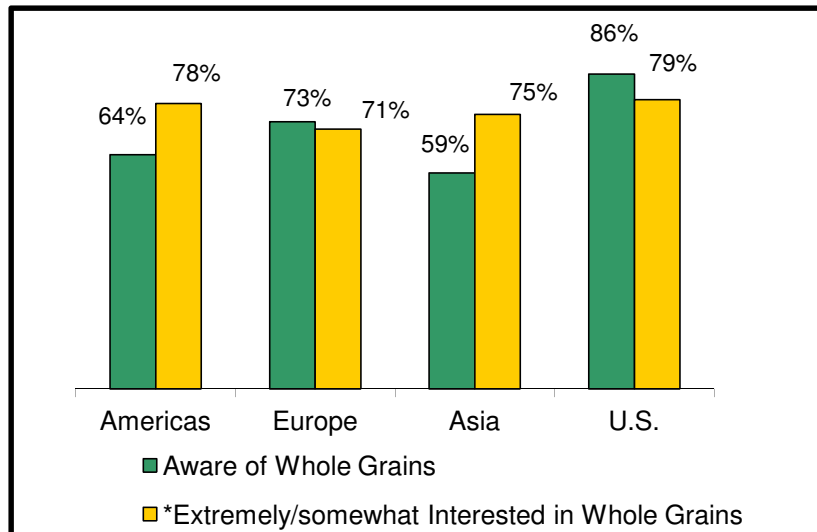
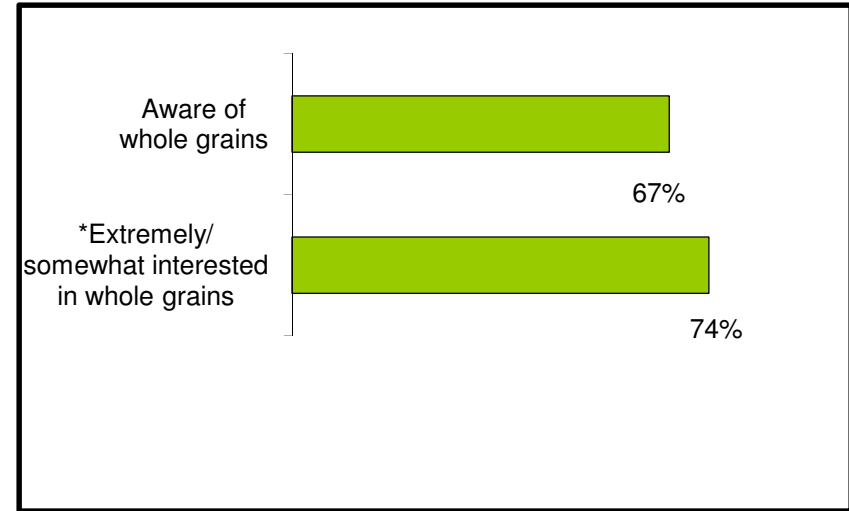
- > Aleurone Dusted raisins
 - Raisins typically coated in sugar and wax
 - Dust with cinnamon/aleurone mixture
 - Retain moisture
- > Meat extender
 - Helps to retain fat
 - Assists in carmelization
 - Retains moisture
- > Nut butters
 - Disperses well in fat/oil
- > Seasonings/rubs
- > Salad toppers
- > Ice cream
- > Meal replacement beverages
- > Powder addition to smoothie

CHALLENGES IN THE US MARKET

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Promotion/Marketing

Whole grains ranks high on awareness as well as interest across the globe



Labeling

- > 'Aleurone' and wheat bran fraction
- > Education to consumers
- > Consumers want to see more 'Whole Grain options in food



82% **read labels** on food products carefully to find out about ingredients, fat content and/or calories ¹

83% sometimes **change their purchase decision** after reading the nutrition label ¹

Sources: 1. GfK Roper Reports US, 2.. NMI's 2010 Health & Wellness Trends Report

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Health Claims and Research Opportunities

- > Clinical trials on human subjects to meet FDA's requirements for health claims in food
- > Claims of interest include prebiotic and cardiovascular
- > Explore potential claims for supplement use

Whole Grain Health Claim

*Food must contain 51% or more whole grain ingredients by weight per reference amount customarily consumed

"Diets rich in whole grain foods and other plant foods and low in total fat, saturated fat, and cholesterol, may help reduce the risk of heart disease and certain cancers."



*Reference

<http://www.fda.gov/Food/LabelingNutrition/LabelClaims/FDAModernizationActFDAMAClaims/cm073639.htm>

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Opportunities for Chinese Market

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