

Funds for this project were provided through the Idaho State Department of Agriculture Specialty Crop Block Grant Program.



webinar presentation

USA Dry Pea & Lentil Council



Presentation Objectives

- Overview: Pulses and pulse-based ingredients
- The role of egg and dairy ingredients in food product development
- Pulse ingredients as egg and dairy alternatives
- How to use pulse ingredients as egg and dairy alternatives and extenders in food formulation
- Conclusions



REMINDER Please email Post-WEBINAR questions to amcdaniel@pea-lentil.com

webinar presenta



Section 1

Overview: Pulse and Pulse-Based Ingredients

- Pulses definitions and nomenclature
- Nutritional advantages of pulses
- Pulse production in the United States



REMINDER Please email WEBINAR questions to amcdaniel@pea-lentil.com



What are Pulses?

- 1. Pulses are legumes classified separately from oilseeds, such as peanuts and soybeans.
- 2. There are **10 categories of pulses,** as defined by the U.N. Food & Agriculture Organization (FAO). Of these, seven are of commercial importance as foods and only five are significant in international food trade. The remainder serve primarily as animal feeds.
- 3. Because they return or "fix" nitrogen in the soil, pulses are **highly sustainable** and often used as rotational crops to restore the quality of farmland.
- 4. Rich in protein, protein quality, soluble fiber, insoluble fiber, antioxidants, vitamins, minerals, and low in oil content, pulses are gaining attention as nutritionally superior foods and food ingredients.
- 5. Pulses are used in many different ways in foods today.
- 6. Pulses are also **free of gluten and other allergens** that must be declared in FDA allergen declaration labels.

webinar presenta



What are Pulses?

Pulses important to human food consumption:

- 1. Chickpeas (garbanzo beans)
- 2. Dry beans (*Phaseolus* spp.)
- 3. Lentils
- 4. Dry peas (field peas)
- 5. Broad (fava) beans
- 6. Pigeon peas
- 7. Cowpeas















VANTAGE Inc. webinar presentation



What are Pulses?

Pulses that are important to food formulation

We will focus upon three categories produced in the United States:

- Chickpeas (garbanzo beans)
- Dry peas (field peas)
- Lentils

Chickpeas (Garbanzo)



Split Yellow Peas





Regular Lentils



Pardina Lentils





BEST VANTAGE Inc. webinar presentation





Pulses offer Exceptional Nutritional Value

Food Reference	Protein	Fat	Starch & Sugars	Fiber
Beef ¹	77.5	8.6	0.0	0.0
Whole Soy Flour - Raw	35.0	20.0	25.6	9.6
Dry Peas	23.7	1.3	45.5	16.6
Regular Lentils	26.3	1.1	45.0	13.6
Chickpeas	24.4	5.9	41.1	8.7
Whole Wheat	13.2	2.5	61.3	10.0
Whole Rice Flour	5.6	1.4	77.7	2.4
Tapioca Flour	0.2	0.0	87.8	0.9

PULSE COMPOSITION

 $\left[\frac{\sigma}{100\sigma} \right]$

Plus...

- Superior amino acid profiles
- Vitamins
- Minerals
- Low-Glycemic Index

webinar presents

Non-GMO

BEST VENTAG

¹ Whole Chuck, 10% moisture basis

Sources: Canadian Grain Commission; U.S. Dept. of Agriculture-ARS; Cho, S., Prosky, L. and Dreher, M. Complex Carbohydrates in Foods, 1999, Marcel Dekker, Inc., New York, NY.



What about Protein and Fiber?

2012 Food & Health Survey Consumer Attitudes Toward Food Safety, Nutrition & Health

Survey conducted by the International Food Information Council (IFIC)

The percentage of consumers surveyed that have considered whether or not a food contains the following nutrients when making purchase decisions about packed food and beverages is:

webinar presen

- Fiber 62%
- Protein 56%

Protein and fiber are sought-after nutrients!



Where are Pulses Grown?

The United States is one of the premier pulseproducing regions in the world.

U.S. Pulse Production				
Metric Tons 2011		Global Rank		
Dry Peas	255,150	9th		
Lentils	214,640	Sth		
Chickpeas	97,205	16th		

Source: United Nations FAOSTAT

The United States also provides...

- A superior production, manufacturing and distribution infrastructure.
- Multiple university and technical centers to provide technical support and innovation.

webinar presental

Because of the U.S.'s highly developed quality grading, handling and production control systems, U.S. pulse producers receive top dollar for their pulses in world export markets.



11

Pulses as Food Ingredients

Pulses can be processed into a variety of food ingredients.





Section 2

The Role of Egg and Dairy Ingredients in Food Formulation

- Functional properties
- Food applications
- Allergenicity issues
- Economics



REMINDER Please email Post-WEBINAR questions to amcdaniel@pea-lentil.com

REST VANTARE INC.

webinar presentation



Functional Ingredients



BEST VANTAGE Inc. webmar presentation



Functional Protein Ingredients

Raw Material Sources <u>%-Protein</u>	Protein Concentrates	<u>%-Protein</u>	Protein Isolates
 Soy (dry) 35.0 % Milk (wet) 3.5 % Whey (wet) 0.8 % 	 SPC (dry) MPC (dry) WPC (dry) 	40-90% 40-90% 40-90%	SPI 90 + % MPI 90 + % WPI 90 + %
• Eggs (wet) 10.9%	 Yolk (wet /dry) 	15.8% protein 26.5% lipid	34.0% protein 55.8% lipid
	 Albumen (wet /dry) 	8.0% protein	82.4% protein



Eggs

Fats

Proteins

Lecithin

Functional Properties of Eggs

Aeration, foaming

Binding, adhesion

Gelation, coagulation

Emulsification

Humectancy

Thickening, mouthfeel







Functional Properties Dairy Ingredients

Dairy

Proteins

Nutrition

Aeration, foaming

Binding, adhesion

Gelation, coagulation

Emulsification

Humectancy

Thickening, mouthfeel



webinar presentation



Gluten-Free and Allergen Concerns?

U.S. Food Allergen Labeling and Consumer Protection Act of 2004

FALCPA passage was based on estimates that eight major food allergens account for 90% of all food allergies:

- Milk
- Eggs
- Fish
- Crustacean shellfish
- Tree nuts
- Peanuts
- Wheat
- Soybeans

- FALCPA required all foods to clearly identity all ingredients that contained one or more of the identified allergens.
- Pulses can play important roles as ingredient alternatives for those food allergens highlighted in red.

webinar prese



Why Food Allergens are of Concern?

Percent of children with a reported food or digestive allergy in 12-month period



The incidence of food allergies in children has been trending upwards.

binar presente

Adapted from : Branum A, Lukacs S. Food allergy among U.S. children: Trends in prevalence and hospitalizations. National Center for Health Statistics Data Brief. 2008. Retrieved from http://www.cdc.gov/nchs/data/databriefs/db10.htm





Egg & Dairy Ingredients: Economics

Ten-year price trends for dried whole egg and dairy ingredients



webinar presentation

Raw Material Price Trends (\$ /kg)



Egg and milk protein price drivers Global commodities demand

Feed costs: approximately 60-70% of milk and egg costs reflect the price of animal feed.

Feed costs have been increasing because:

- Corn, soy and alfalfa exports are increasing rapidly.
- Corn diversions to biofuels remain high.
- Alfalfa remains vulnerable to drought conditions.

webinar preser



Egg and milk protein price drivers Export demand

Whole Egg Exports [Thousand-Ib Liquid Equivalents]



BEST VANTAGE

Inc.

webinar presentation

Source: U.S. Dept. of Commerce



Egg and milk price drivers New products





Müller-Pepsico Yogurt

McDonald' s Egg White Delight McMuffin.

webinar presentation

Inc.

22



Section 3

Pulse ingredients as egg and dairy alternatives

- Economic benefits of using pulses
- Pulses as egg and dairy alternatives and extenders
- Functional properties of pulses
- Choosing egg and dairy alternatives and extenders



REMINDER Please email WEBINAR questions to amcdaniel@pea-lentil.com

webinar present



Ingredient Cost Considerations

When developing new food products, the following ingredient variables are of critical importance.

webinar presental

- Raw material price
- Raw material price volatility
- Raw material availability



Protein Ingredient Cost Considerations

Ten-year price trends for dried whole egg, dairy and pea ingredients.



BEST VANTAGE Inc.

webinar presentation



Protein Ingredient Cost Considerations

Ingredient Price on Unit-Protein Basis (2010)

	%-Protein	\$/ kg -2010	\$/kg Protein	
Dried Whole Egg Powder	47%	\$ 3.49	\$ 7.42	
Nonfat Dry Milk	34%	\$ 2.75	\$ 8.09	
Whole Milk Solids	27%	\$ 4.36	\$16.16	
WPC 50	50%	\$ 2.09	\$ 4.18	
Peas (field)	24%	\$ 0.19	\$ 0.80	



Protein Ingredient Cost Considerations

Ingredient Price Volatility (2001–2010)

	%-Protein	Avg. Price (\$/kg)	
Dried Whole Egg Powder	47%	\$ 3.09	
Nonfat Dry Milk	34%	\$ 2.41	
Whole Milk Solids	27%	\$ 4.04	
WPC 50	50%	\$ 1.69	
Peas (field)	24%	\$ 0.16	



Protein Ingredient Cost Considerations Conclusions:

- Pulse protein raw material costs are relatively low compared to other protein sources.
- Pulse-ingredient price volatility should have relatively little impact on finished food product prices.
- Pulse proteins are commodity products produced in high abundance and to very high quality standards in the United States.

webinar presents



Functionality Benefits of Pulses

The functional properties of pulses replicate many of the functional properties of egg and dairy proteins.

Egg and Dairy Protein Functionality

Structure

- Strength
- Texture /mouthfeel
- Coloration
- Emulsification
- Gelation
- Film-forming
- Foaming

- Water control
- Viscosity Flavor
- Opacity / turbidity
- Particle suspension
- Adhesion
- Agglomeration

Pulse Ingredient Functionality

- Structure
- Strength
- Texture /mouthfeel
- Emulsification
- Gelation
- Film-forming
- Foaming

- Water control
- Viscositv
- **Opacity / turbidity**
- Particle suspension

webinar presentation

- Adhesion
- Agglomeration



Section 4

How to use pulse ingredients as egg and dairy alternatives and extenders in food formulation.

- Properties
- Formulation
- Cost-Savings
- Examples



REMINDER Please email Post-WEBINAR questions to amcdaniel@pea-lentil.com

VANTAGE Inc. webinar presentation



Step 1: determine what functional role egg or dairy ingredients play in your food product







Step 2: determine what role pulses should play

webinar presents

- 100% egg and dairy replacers
- Partial egg and dairy replacers
- Egg and dairy extenders
- Egg and dairy-extender extenders



Step 3: determine which pulse components deliver the desired functional attributes.





Step 4: select the pulse ingredients that deliver the desired functional attributes.

Cakes and Cookies



- · Aeration, foaming
- Binding, adhesion
- Emulsification
- Gelation, coagulation

- Pulse flour
- Cooked pulse flour
- Pregel pulse flour

webinar presental

- PPC
- PPI
- Pulse starch
- Pulse bran

Degree of Egg or Dairy Substitution: **100**%



Step 4: select the pulse ingredients that deliver the desired functional attributes.

Battered & Fried Product



- Binding, adhesion
- Emulsification
- Gelation, coagulation

- Pulse flour
- Cooked pulse flour
- Pregel pulse flour

webinar presentat

- PPC
- Pulse starch
- Pulse bran

Degree of Egg or Dairy Substitution: **100**%



Step 4: select the pulse ingredients that deliver the desired functional attributes.

Pasta



- Binding, adhesion
- Texture, mouthfeel
- Gelation, coagulation

- Pulse flour
- Cooked pulse flour
- Pregel pulse flour

webinar presenta

- PPC
- Pulse Bran

Degree of Egg or Dairy Substitution: **100**%



Resources:



Northern Crops Institute NDSU Dept. 7400 PO Box 6050 Fargo, North Dakota, USA 58108-6050 Phone: 701-231-7736 Fax: 701-231-7235 Email: nci@ndsu.edu



Prof. Cliff Hall III



Thunyaporn ("Naggie") Jeradechachai

webinar presentation



Example 1:

	White Cake Formula weight (g)		
	w/Egg	w/ PPI	
Cake flour	130	130	
Baking powder	7	7	
Shortening	50	50	
Pea Protein	-	6	
Water	45	115	
Fresh Whole Egg	69	-	
Sugar	100	100	
Salt	3	3	
Vanilla Powder	3	3	
	407	414	

*Source: "*Sensory Qualities of Cakes and Cookies Made with Pea Proteins as an Egg Replacer.", 2012: Mary Niehaus, Clifford Hall III and Hieu Hoang; School of Food Systems, North Dakota State University, Fargo, ND

webinar presental





White cakes prepared from pea concentrate, peas isolates, and eggs. Surface and cross-sectional views are presented of the cakes.

Research conducted by Dr. Clifford Hall III, Associate Professor, Food and Cereal Science, North Dakota State University



Example 1:



*Source: "*Sensory Qualities of Cakes and Cookies Made with Pea Proteins as an Egg Replacer.", 2012: Mary Niehaus, Clifford Hall III and Hieu Hoang; School of Food Systems, North Dakota State University, Fargo, ND

webinar presentation

40

Example 2: Sensory Properties of Sugar Cookies (9 = "high") Sugar Cookie Formula

How to use pulses as egg and dairy

alternatives and extenders

Formula weight (g)

USA Dry Pea & Lentil Council



Source: "Sensory Qualities of Cakes and Cookies Made with Pea Proteins as an Egg Replacer.", 2012: Mary Niehaus, Clifford Hall III and Hieu Hoang; School of Food Systems, North Dakota State University, Fargo, ND

TGase

acceptability

Overall

webinar presentati

Texture



Example 3:

Level of pea flour incorporation

	0%	5%	10%	15%	20%
Cooking Quality (al dente)					
Cooked Wt (g)	75.8	75.3	77,7	77.2	76.3
Cooking Loss (%)	5.9	5.6	5.9	6.1	6.3
Cooked Firmness (g cm)	12.9	12,4	12.5	13.4	14.4
Cooking Quality (overcook 6 min)					
Cooked Wt (g)	87.4	86.7	87.9	88.0	88.0
Cooking Loss (%)	7.2	6.6	7.3	7.2	7.3
Cooked Firmness (g cm)	93	9.0	9.1	9.6	10.2

Pasta al-dente quality and robustness increased with increased levels of pea flour incorporation.

Source: Northern Crops institute



Yellow Pea	Corn
100%	100%

100% Legume Pasta

Useful tip: Addition of 0.5-1.0% calcium sulfate will further increase al dente texture and robustness.

* Patent Pending

Inc. webinar presentati



Step 2: determine what role pulses should play

- 100% egg and dairy replacers
- Partial egg and dairy replacers
- Egg and dairy extenders
- Egg and dairy-extender extenders

EXAMPLES

Fiberstar, Inc. River Falls, Wis.

Florida Food Products, Inc. Eustis, Fla.

Glanbia, Inc. Madison, Wis.

webinar presents



Section 4

Summary and Conclusions

- Summary & Conclusions
- Resources
- Questions and Answers



REMINDER Please email Post-WEBINAR questions to amcdaniel@pea-lentil.com





Summary and Conclusions

- Egg and dairy ingredients are high-cost ingredients subject to high price volatility.
- Pulse ingredients (protein, starch, fiber, bran) will duplicate many of the functional properties of egg and dairy ingredients.
- Pulse ingredients are likely to be lower in cost and exhibit lower price volatility than dairy or egg-derived ingredients.
- Pulse-based ingredients can function as egg and dairy replacers and extenders.
- Primary applications for pulses as egg or dairy extenders include:
 - a. Bakery products
 - b. Pasta
 - c. Battered and fried products
 - d. Meat binders
 - e. Beverages
 - f. Soups, sauces and salad dressings
 - g. Extenders for other egg and dairy extenders



Additional Resources

• The USA Dry Pea and Lentil Council

Contact:Ali McDanielEmail:amcdaniel@pea-lentil.comTel.1-208-596-5026Website:www.pea-lentil.com

• Northern Crops Institute (North Dakota State University)

webinar presentat

Contact:Thunyaporn "Naggie" JeradechachaiEmail:T.jeradechachai@ndsu.eduTel.1-701-231-7736Website:www.northern-crops.com

• BEST VANTAGE Inc.

Contact:Daniel BestEmail:info@bestvantageinc.comTel.1-847-714-9527Website:www.bestvantageinc.com



Industry Resources

Best Cooking Pulses, Inc.. Portage la Prairie, MB www.bestcookingpulses.com

Dakota Dry Bean, Inc. Grand Forks, ND www.dakotadrybean.com

Fiberich Technologies, Inc. St. Louis Park, MN www.fiberichtech.com

George F. Brocke & Sons Kendrick, ID gfbrocke.com

Harvest Innovations Indianola, IA harvest-innovations.com Hinrichs Trading Co. Pullman, WA www.hinrichstrading.com

Inland Empire Foods, Inc. Riverside, CA www.inlandempirefoods.com

SK Food International Fargo, ND www.skfood.com

United Pulse Trading Bismarck, ND www.alliancegrain.com

Woodland Foods, Inc. Gurnee, IL woodlandfoods.com



Additional Resources

A downloadable copy of this Webinar presentation will be posted on the USA Dry Pea & Lentil Council website in the near future @ www.pea-lentil.com/webinars. We will send webinar registrants an email notification when it becomes available.

Upcoming Webinars: Please stay tuned for future 2013 webinar presentations on more specific uses of pulse ingredients in food product development.



QUESTIONS?



REMINDER Please email Post-WEBINAR questions to amcdaniel@pea-lentil.com

49

BEST VANTAGE Inc.

webinar presentation



Thank You for your participation



R Please email WEBINAR questions to amcdaniel@pea-lentil.com

