CEUs – New Process

Certified Crop Advisor (CCA)
- Sign in and out of each session you attend.
- Pickup verification sheet at conclusion of each session.
- Repeat this process for each session, and each day you wish to receive credits.

Pest Control Advisor (PCA), Qualified Applicator (QA), Private Applicator (PA)
- Pickup scantron at the start of the day at first session you attend; complete form.
- Sign in and out of each session you attend.
- Pickup verification sheet at conclusion of each session.
- Turn in your scantron at the end of the day at the last session you attend.

Sign in sheets and verification sheets are located at the back of each session room.
AGENDA

• Maya Erwin, Blue Diamond Growers, moderator
• Swati Kalgonakar, Almond Board of California
• Kathy Musa-Veloso, Intertek Health Sciences, Inc.
• Janice Rueda, ADM
PROTEIN – THE BASICS

Dr. Swati Kalgaonkar
Senior Manager, Nutrition Research Program
USDA Nutrition Guide
WHY Protein?
6 PRIMARY FUNCTIONS OF PROTEINS
1. REPAIR & MAINTENANCE
2. ENERGY
3. TRANSPORT & STORAGE
4. ENZYMES

PEPSIN
TRYPsin
LIPASE
AMYLASE
5. ANTIBODIES
6. HORMONES
TWENTY COMMON AMINO ACIDS

Note: This chart only shows those amino acids for which the human genetic code directly codes for. Selenocysteine is often referred to as the 21st amino acid, but is encoded in a special manner. In some cases, distinguishing between asparagine/aspartic acid and glutamine/glutamic acid is difficult. In these cases, the codes asx (B) and glx (Z) are respectively used.
## TYPES OF AMINO ACIDS

<table>
<thead>
<tr>
<th>Non-Essential</th>
<th>Conditionally Essential</th>
<th>Essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alanine</td>
<td>Arginine</td>
<td>Histidine</td>
</tr>
<tr>
<td>Aspartate</td>
<td>Asparagine</td>
<td>Isoleucine</td>
</tr>
<tr>
<td>Cysteine</td>
<td>Glutamine</td>
<td>Leucine</td>
</tr>
<tr>
<td>Glutamate</td>
<td>Glycine</td>
<td>Methionine</td>
</tr>
<tr>
<td></td>
<td>Proline</td>
<td>Phenylalanine</td>
</tr>
<tr>
<td></td>
<td>Serine</td>
<td>Threonine</td>
</tr>
<tr>
<td></td>
<td>Tyrosine</td>
<td>Tryptophan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Valine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lysine</td>
</tr>
</tbody>
</table>

*Stress effects on the body*

These can come Only from food
PROTEIN INTAKE RECOMMENDATIONS

- World Health Organization
- Food and Agriculture Organization of the United Nations
- United Nations University
- Institute of Medicine of the National Academies
- EFSA (European Food Safety Authority)
- Australian Government National Health and Medical Research Council

0.83g/kg BW/d
- 165lbs - 62.25g

0.8g/kg BW/d
- 165lbs - 60g

0.83g/kg BW/d
- 165lbs - 62.25g

0.84g/kg BW/d
- 165lbs - 63g
GLOBAL PROTEIN INTAKE
PROTEIN IN TRANSITION

Transitioning to a Plant Based Diet
WHY PLANT PROTEIN?

Vegetarianism  Vegan  The Flexitarian  Plant-Based Lifestyle

October 1 is World Vegetarian Day

BE kind TO every KIND

Healthy Food Healthy Planet

Do it for life!
LABELING AND ADVERTISING ALMONDS WITH CLAIMS RELATED TO PROTEIN – A GLOBAL PERSPECTIVE

Kathy Musa-Veloso, PhD
Director, Health Claims and Clinical Trials
NUTRIENT CONTENT CLAIMS

Describe the level of a nutrient or dietary substance in the food, either directly or by implication.

Regulations ensure that descriptive terms such as “high”, “good source of”, or “more” are used consistently.

STRUCTURE/FUNCTION CLAIMS

Describe the role of a nutrient in the maintenance of normal body structures and functions.

Are regulated in some countries (e.g., European Union, Australia/New Zealand, Canada, South Korea), but not in others (e.g., United States).
POTENTIAL NUTRIENT CONTENT CLAIMS FOR ALMONDS

Excellent source of antioxidant vitamin E

Cholesterol- and sodium-free

Low in saturated fat

Excellent source of copper, manganese, and riboflavin

Good source of fiber

No added sugars

Good source of magnesium and phosphorus

WHAT ABOUT PROTEIN???
What nutrient content and structure/function claims can we make for protein from almonds?
LEGEND

- **Red** or ×: protein claim **cannot** be made for almonds.
- **Green** or ✓: protein claim **can** be made for almonds.
EU – CRITERIA FOR MAKING PROTEIN CLAIMS

15% of the energy value of almonds is from protein.

✓ Protein contributes to a growth in muscle mass.
✓ Protein contributes to the maintenance of muscle mass.
✓ Protein contributes to the maintenance of normal bones.
AUSTRALIA/NEW ZEALAND – CRITERIA FOR MAKING PROTEIN CLAIMS

Each 28-gram serving of almonds provides approximately 6 grams of protein.

- If at least 5 g of protein per serving.
- Good source of Protein
  - Necessary for tissue building and repair.
  - Necessary for normal growth and development (of bone) (children aged ≥4 years).
  - Contributes to the growth of muscle mass.
  - Contributes to the maintenance of muscle mass.
  - Contributes to the maintenance of normal bones.
Almonds provide:

- **35%** of the protein NRV/100 g; or
- **6%** of the NRV/100 kcal; or
- **10.5%** of the NRV/30-gram serving.

**NRV = Nutrient Reference Value**

**South Korea – Criteria for Making Protein Claims**

- **Source of Protein**
  - At least 10% of the NRV/100 g OR 5% of the NRV/100 kcal OR 10% of the NRV/serving

- **Rich in Protein**
  - At least 20% of the NRV/100 g OR 10% of the NRV/100 kcal OR 20% of the NRV/serving

- ✓ Constituent of muscles, connective tissues, and other body components
- ✓ Essential for the production of enzymes, hormones, and antibodies
- ✓ Essential for the transport and storage of nutrients and other active substances
- ✓ Essential for the maintenance of bodily fluids and acid-base balance
- ✓ Essential for the synthesis of energy, glucose, and lipids.
The declaration of the % Daily Value (DV) for protein is mandatory only if:

- A protein content claim is made for the product (e.g., “source of protein”); or
- The product is intended for infants and children under 4 years of age.

Otherwise, the declaration of the %DV for protein is voluntary.
Why not include the %DV for protein on the Nutrition Facts label???
BECAUSE....YOU HAVE TO FACTOR IN THE QUALITY OF THE PROTEIN...AND THIS CAN BE EXPENSIVE

Protein Quality

- Are all 9 essential amino acids present?
- Are their levels sufficient to support the growth of preschool aged children?
- Even after considering digestibility?
# PROTEIN QUALITY OF ALMONDS

<table>
<thead>
<tr>
<th>Amino Acid</th>
<th>Level in Almonds (mg/g of protein)$^a$</th>
<th>Amino Acid Pattern for Preschool Aged Children (mg/g Protein)</th>
<th>Amino Acid Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threonine</td>
<td>2.49</td>
<td>3.4</td>
<td>0.732</td>
</tr>
<tr>
<td>Valine</td>
<td>2.89</td>
<td>3.5</td>
<td>0.827</td>
</tr>
<tr>
<td>Methionine+Cysteine</td>
<td>2.05</td>
<td>2.5</td>
<td>0.819</td>
</tr>
<tr>
<td>Isoleucine</td>
<td>2.59</td>
<td>2.8</td>
<td>0.924</td>
</tr>
<tr>
<td>Leucine</td>
<td>5.76</td>
<td>6.6</td>
<td>0.872</td>
</tr>
<tr>
<td><strong>Phenylalanine+Tyrosine</strong></td>
<td><strong>7.25</strong></td>
<td><strong>6.3</strong></td>
<td><strong>1.150</strong></td>
</tr>
<tr>
<td>Histidine</td>
<td>1.86</td>
<td>1.9</td>
<td>0.980</td>
</tr>
<tr>
<td><strong>Lysine</strong></td>
<td><strong>2.67</strong></td>
<td><strong>5.8</strong></td>
<td><strong>0.460</strong></td>
</tr>
<tr>
<td>Tryptophan</td>
<td>0.92</td>
<td>1.1</td>
<td>0.833</td>
</tr>
</tbody>
</table>

$^a$ Average for 4 varieties of almonds, including Butte, Independence, Monterrey, and Nonpareil; based on unpublished data from the lab of Dr. James House, University of Manitoba.
DIGESTIBILITY OF PROTEIN IN ALMONDS

• Assessed by examining the amount of protein consumed from almonds versus the amount of protein excreted in feces.

• Animal studies are used to estimate this value.

• Based on unpublished data from the laboratory of Dr. James House (University of Manitoba), the digestibility of almond protein is approximately 88% (average for 4 varieties – Butte, Independence, Monterrey, and Nonpareil).

• Protein Digestibility Corrected Amino Acid Score (PDCAAS) for almonds: Limiting Amino Acid X Digestibility = 0.4033
WHAT IS THE CONTRIBUTION OF ONE 30-GRAM SERVING OF ALMONDS TO THE DV

% DV

PCDAAS

AMINO ACID SCORE OF THE LIMITING AMINO ACID

PROTEIN DEGISTIBILITY

AMOUNT OF PROTEIN IN A 30-GRAM SERVING OF ALMONDS

DV FOR PROTEIN

0.460

0.87675

6.8 g

50 g

100%

5.5% of the DV for protein . . . is this sufficient to make a nutrient content claim for protein in the U.S.?
UNITED STATES – CRITERIA FOR MAKING PROTEIN CLAIMS

Almonds provide:
• **5.5% of the DV for protein per 30-gram serving.**

- **10 to 19% of the DV per serving**
- **At least 20% of the DV per serving**
- **Source of Protein**
- **High in Protein**

- **Scientifically substantiated claims related to the role of protein in the maintenance of bodily structures or functions.**
Protein Rating of Almonds per Reasonable Daily Intake: 6.4

- Protein helps build and repair body tissues.
- Protein helps build antibodies.
- Protein helps build strong muscles.
WHAT IS THE PROTEIN RATING???

Protein Rating

PROTEIN EFFICIENCY RATIO (PER)

PROTEIN CONTENT OF ALMONDS

REASONABLE DAILY INTAKE OF ALMONDS

1.008 [amount of weight gained (in grams) relative to amount of protein consumed (in grams) after 4 weeks by male weanling rats]

22.82%

6.4

28 GRAMS
<table>
<thead>
<tr>
<th>Protein Quality Considered in making Claims</th>
<th>European Union</th>
<th>South Korea</th>
<th>Australia/ New Zealand</th>
<th>United States</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ability to label almonds as a source of protein</th>
<th>European Union</th>
<th>South Korea</th>
<th>Australia/ New Zealand</th>
<th>United States</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ability to label almonds with protein structure/ function claims</th>
<th>European Union</th>
<th>South Korea</th>
<th>Australia/ New Zealand</th>
<th>United States</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>
CONCLUSIONS AND DISCUSSION

- There are limitations of using PDCAAS (U.S.) and PER (Canada).
- Neither is relevant to adults; PER is not even relevant to humans.
- For PDCAAS, the amino acid requirements of pre-school aged children were derived in 1981 in a limited number of 2-year-old children recovering from malnutrition.
- Both generally over-estimate the quality of animal proteins and under-estimate the quality of plant proteins for humans, particularly adult humans.
- Protein quality definitely is relevant to individuals who rely almost exclusively on one source of protein (e.g., formula-fed infants, patients receiving enteral feeds); but, people typically rely on a variety of foods to meet their protein needs.
  - Why is protein quality assessed at the level of each individual food as opposed to the whole diet???
The future of protein claims in Canada

Commentary

An Appetite for Modernizing the Regulatory Framework for Protein Content Claims in Canada

Christopher P. F. Marinangeli 1,*, Samara Foisy 2, Anna K. Shoveller 3, Cara Porter 2, Kathy Musa-Veloso 4, John L. Sievenpiper 5,6,7,8 and David J. A. Jenkins 5,6,7,8

• *Nutrients 2017, 9(9), 921; doi:10.3390/nu9090921
• Recommendations were made to either:
  • Drop the application of protein quality entirely in the determination of claim eligibility (similar to South Korea, Europe, and Australia/New Zealand); or
  • Adopt PDCAAS (to align with the U.S.), and have 3 cut-offs for protein content claims – source of (≥5% DV), good source of (≥10% DV), and excellent source of (≥20% DV) – in line with claims for fiber and vitamins and minerals, to create more opportunities for plant-based foods.
• Either option would result in the ability to claim almonds as a “source of protein”.

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THANK YOU!

Kathy Musa-Veloso, Ph.D.
Director, Health Claims and Clinical Trials
Food and Nutrition Group
Intertek Scientific and Regulatory Consultancy
Tel: +1 905-542-2900 ext 293
kathy.musa-veloso@intertek.com
Beans Are Hot!
Global Trends in Plant-based Innovation

Janice MW Rueda, Ph.D.
Archer Daniels Midland Company

Janice.Rueda@adm.com
Office: 217-451-7722
Cell: 217-413-7346
WILD Flavors and Specialty Ingredients (WFSI) Extends ADM’s Advantaged Portfolio into $50B Specialty Ingredients Space
Industry’s broadest portfolio of on-trend ingredients

### Addressing nutrition, function, texture and taste

<table>
<thead>
<tr>
<th>Specialty Proteins</th>
<th>Nuts, Seeds, &amp; Ancient Grains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beans, Peas &amp; Pasta</td>
<td>Polyols &amp; Specialty Sweeteners</td>
</tr>
<tr>
<td>Colors</td>
<td>Mint</td>
</tr>
<tr>
<td>Emulsifiers</td>
<td>Ingredient Systems &amp; Bases</td>
</tr>
<tr>
<td>Flavors &amp; Extracts</td>
<td>Hydrocolloids</td>
</tr>
<tr>
<td>Nutritional Ingredients</td>
<td>Fiber</td>
</tr>
</tbody>
</table>
What is the role of the food industry?

- 47% of food budget was for foods eaten outside of the home
- Eating one meal away from home per week = 2 lbs. weight gain per year!
- \(\downarrow\) Fruit, whole grains, vegetables
- \(\uparrow\) Total fat, saturated fat, sodium, added sugar
Protein Imparts Health Halo onto Snacks

• >80% of consumers believe **plant-based proteins** add health and wellness attributes to snacks
• Nearly 65% of consumers believe protein is important
• High protein snacks are more important to women (65%) than men
• Consumers 25-34 years old reported highest interest in high protein snacks

ADM Outside VoiceSM Snacking Behavior Study, 2017
Global Product Launches: High Protein Snacks

![Chart showing global product launches by region from 2012 to 2016. The chart highlights the growth in product launches across Asia/Pacific, Europe, North America, and remaining countries.](chart)
Why Do Consumers Want More Protein?

Why Do Consumers Want More Protein?

Why Do Consumers Want More Protein?

Google: “Plant-based Protein”

Pepsi Exec: Plant Protein Will Spark a Sea of Change

By Anna Starostinetskaya | October 30, 2017

Business

Boosting its vegan bona fides, Campbell Soup joins Plant Based Foods Association

Updated: OCTOBER 30, 2017 — 4:26 PM EDT

Leonardo DiCaprio joins star-studded investor line up at Beyond Meat

By Elaine Watson

High Protein Snacks: Protein Ingredients

- Soy
- Whey
- Pea
- Other
- High Protein Snacks
<table>
<thead>
<tr>
<th>Potential beneficial effect of plant proteins</th>
<th>Cardiovascular health</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High blood pressure</strong></td>
<td></td>
</tr>
<tr>
<td>• ≥130 systolic mm Hg</td>
<td></td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>• ≥85 diastolic mm Hg</td>
<td></td>
</tr>
<tr>
<td><strong>Low HDL-cholesterolemia</strong></td>
<td></td>
</tr>
<tr>
<td>• &lt;1.03 mmol/L in men</td>
<td></td>
</tr>
<tr>
<td>• &lt;1.29 mmol/L in women</td>
<td></td>
</tr>
<tr>
<td><strong>High triglyceridemia</strong></td>
<td></td>
</tr>
<tr>
<td>• ≥1.7 mmol/L</td>
<td></td>
</tr>
<tr>
<td><strong>High glycemia</strong></td>
<td>Glucose homeostasis</td>
</tr>
<tr>
<td>• ≥5.6 mmol/L</td>
<td></td>
</tr>
<tr>
<td><strong>High waist circumference</strong></td>
<td>Body composition</td>
</tr>
<tr>
<td>• ≥102 cm in men</td>
<td></td>
</tr>
<tr>
<td>• ≥ 88 cm in women</td>
<td></td>
</tr>
</tbody>
</table>

Plant-based Diets = Lower Land Use

Plant-based Diets = Lower Land Use

Why Just Innovate When You Can BeanOvate?
Nutrition Attributes As Purchase Drivers

New Product Introductions
Top Product Claims in NA Snacks

Low/No/Reduced Transfat
Wholegrain
Low/No/Reduced Cholesterol
Low/No/Reduced Fat
High/Added Fiber
High Protein

Source: Mintel; n= ~39k claims; Plant Based includes: vegan, vegetarian, no animal products
## Beans Put the *BETTER* in “Better-for-You”

<table>
<thead>
<tr>
<th>100g dry grain</th>
<th>Corn</th>
<th>Wheat</th>
<th>White Rice</th>
<th>Brown Rice</th>
<th>Quinoa</th>
<th>Navy Beans</th>
<th>Black Beans</th>
<th>Chickpeas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>365</td>
<td>340</td>
<td>365</td>
<td>367</td>
<td>368</td>
<td>337</td>
<td>341</td>
<td>378</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>5</td>
<td>2</td>
<td>0.6</td>
<td>3</td>
<td>6</td>
<td>2.7</td>
<td>2.6</td>
<td>7</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>9.4</td>
<td>10.6</td>
<td>7</td>
<td>7.5</td>
<td>14</td>
<td>21.3</td>
<td>22</td>
<td>20.3</td>
</tr>
<tr>
<td>Carbohydrates (g)</td>
<td>74</td>
<td>75</td>
<td>80</td>
<td>76</td>
<td>64</td>
<td>69</td>
<td>66</td>
<td>65</td>
</tr>
<tr>
<td>Fiber (g)</td>
<td>7.3</td>
<td>12.7</td>
<td>1.3</td>
<td>3.6</td>
<td>7</td>
<td>32.5</td>
<td>30.2</td>
<td>16.2</td>
</tr>
<tr>
<td>Potassium (mg)</td>
<td>287</td>
<td>435</td>
<td>115</td>
<td>250</td>
<td>563</td>
<td>1185</td>
<td>1483</td>
<td>718</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>2.7</td>
<td>5.3</td>
<td>4.3</td>
<td>1.2</td>
<td>4.5</td>
<td>5.5</td>
<td>5</td>
<td>4.3</td>
</tr>
<tr>
<td>Magnesium (mg)</td>
<td>127</td>
<td>90</td>
<td>25</td>
<td>116</td>
<td>197</td>
<td>175</td>
<td>171</td>
<td>79</td>
</tr>
</tbody>
</table>

Data from the USDA National Nutrient Database/Medallion Labs

Highlighted Text ≥ 20% DV          Bold text ≥ 10% DV
Not All Carbs Are Created Equal

Many Health Benefits

- Low GI → “Second meal effect”
- SCFA production → stable GLU
- Prebiotic: high fiber & resistant starch
- High antioxidant phytochemicals
- Many studies show high satiety effect


Change in blood glucose concentration after eating 50-g carbohydrate portions of individual grains, breads and pasta, breakfast cereals, biscuits, tubers, and dried legumes.

Conversion: SI to traditional units — Glucose: 1 mmol/l ≈ 18 mg/100 ml.
Lifestyle Attributes As Purchase Drivers

New Product Introductions
Top Product Claims in NA Snacks

- Low/No/Reduced Allergen
- Gluten-free
- Non-GMO
- No Additives/Preservatives
- Plant-based

Source: Mintel; n=~39k claims; Plant Based includes: vegan, vegetarian, no animal products
Beans: All of Today’s Trends In One Whole Food Ingredient

ECO-FRIENDLY
- Beans are vital to sustainable agriculture systems
- Grown in rotation with staple crops, beans reduce fertilizer and water input
- GMO-free
- USA-grown

CLEAN-LABEL
- Whole beans are cooked, dehydrated and ground
- Process mimics home cooking
- Solvent-free
- No allergen statement
- Gluten-free

HIGH VERSATILITY
- Extrusion
- Sheeted Snacks
- Baking & Mixes
- Beverages
- Meats & Meals
- High water binding, neutral flavor/color

EASY NUTRITION
- High fiber
- High protein
- High potassium
- Makes the health benefits of beans easy and delicious for consumers to enjoy

Non-GMO
Non-Allergen
Gluten Free
Whole Food
Plant Based
Lifestyle Attributes More Influential Drivers

New Product Introductions
Top Product Claims in NA Snacks

- 2012
- 2013
- 2014
- 2015
- 2016

Lifestyle-based attributes

Nutrition-based attributes

Source: Mintel; n~39k claims; Plant Based includes: vegan, vegetarian, no animal products
Quinoa Set the Trend – How do beans compare?

Global Product Launches 2011 - 2016

Source: Mintel; n=~1000k NPL
Quinoa: A closer look

Global Product Launches 2011 - 2016

Source: Mintel; n=~1000k NPL
Quinoa: A closer look

Global Product Launches 2011 - 2016

Source: Mintel; n=~1000k NPL
Beans are poised for similar growth

Global Product Launches 2011 - 2016

Source: Mintel; n=~1000k NPL

### Category Global Launches 2011-16 CAGR

<table>
<thead>
<tr>
<th>Category</th>
<th>Global Launches</th>
<th>2011-16 CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snacks</td>
<td>3537</td>
<td>21%</td>
</tr>
<tr>
<td>Meals</td>
<td>3121</td>
<td>24%</td>
</tr>
<tr>
<td>Fruit &amp; Vegetables</td>
<td>2775</td>
<td>25%</td>
</tr>
<tr>
<td>Savory Spreads</td>
<td>1716</td>
<td>28%</td>
</tr>
<tr>
<td>Bakery</td>
<td>1646</td>
<td>17%</td>
</tr>
</tbody>
</table>

1: Mintel GNPD, All pulse product launches 2005-2016

---

**Graph Details:**
- **X-axis:** Years 2011-2016
- **Y-axis:** Number of launches (0-4500)
- **Legend:**
  - Orange: Asia/Pacific
  - Blue: Europe
  - Yellow: North America
  - Green: Remaining
  - Red: All Countries

**Note:**
- The graph shows the trend of global “pulse” product launches from 2011 to 2016, with a significant increase noted in 2016.
- The categories include Snacks, Meals, Fruit & Vegetables, Savory Spreads, and Bakery.
- The table on the right provides specific numbers of launches for each category along with the corresponding compound annual growth rates (CAGR) for the period 2011-2016.
The Possibilities Are Endless
Exciting Trends in BeanOvation
Beans + Almonds = NEW OPPORTUNITIES

✓ Complimentary Amino Acid Profiles
✓ Complimentary Health Messages
✓ Product Differentiation Potential
Thank you!
ALMOND PROTEIN CLAIMS
Potential Avenues for the US market

Dr. Swati Kalgaonkar
Senior Manager, Nutrition Research Program
Almond Protein update: A quick recap

Limiting AA score + Protein Digestibility = PDCAAS

Increase in %DV: 2.88% to 5.5%!!
Protein quality of almonds:
Newer method reveals twice the value!!

*Unpublished Data: James House, Univ. of Manitoba, Canada
Where do we go from here?

- The amino acids that are most limited in plant proteins are lysine, methionine, and cysteine.
- Legumes tend to be deficient in methionine and cysteine.
- Grains, nuts, and seeds can be deficient in lysine but high in methionine and cysteine.

Almond amino acid profile:

<table>
<thead>
<tr>
<th>Amino Acid</th>
<th>Level in Almonds (mg/g of protein)*</th>
<th>Amino Acid Pattern for Pre-school Aged Children (mg/g Protein)</th>
<th>Amino Acid Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threonine</td>
<td>2.49</td>
<td>3.4</td>
<td>0.732</td>
</tr>
<tr>
<td>Valine</td>
<td>2.89</td>
<td>3.5</td>
<td>0.827</td>
</tr>
<tr>
<td>Methionine+Cysteine</td>
<td>2.05</td>
<td>2.5</td>
<td>0.819</td>
</tr>
<tr>
<td>Isoleucine</td>
<td>2.59</td>
<td>2.8</td>
<td>0.924</td>
</tr>
<tr>
<td>Leucine</td>
<td>5.76</td>
<td>6.6</td>
<td>0.872</td>
</tr>
<tr>
<td>Phenylalanine+Tyrosine</td>
<td>7.25</td>
<td>6.3</td>
<td>1.150</td>
</tr>
<tr>
<td>Histidine</td>
<td>1.86</td>
<td>1.9</td>
<td>0.980</td>
</tr>
<tr>
<td>Lysine</td>
<td>2.67</td>
<td>5.8</td>
<td>0.460</td>
</tr>
<tr>
<td>Tryptophan</td>
<td>0.92</td>
<td>1.1</td>
<td>0.833</td>
</tr>
</tbody>
</table>

PDCAAS Values of some other plant proteins:

Complementary Proteins

GENERAL RULE OF THUMB

You Complete Me!!!
Future protein claim potential: plant protein partnership (P³)
Future potential: extrude & combine with complimentary protein
Summary

• Almond PDCAAS reassessed
• New data has higher potential
• Plant-protein partnership is of the essence.

Potential Next Steps

• Data publication
• USDA database update
• Exploration of various avenues
What’s Next

Tuesday, December 5 at 3:00 p.m.

• Come See What’s Happening in D.C.! – Room 306-307

• How to Manage a Young Orchard – Room 308-309

• Research Update: Soil Health, Aerial Almond Mapping and Almond Lifecycle Assessment – Room 312-313

• Technology in the Food Safety World: Tools Such as Whole Genome Sequencing – Friend or Foe? – Room 314
Use #AlmondConf to be part of the conversation on Facebook and Twitter
State of the Industry
Tuesday at 4:30 p.m. in Hall C