



Processing and texture challenges for baked tortilla chips

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Agenda

- Overview of the snack market
- Recent launches on tortilla chips
- Consumer preference study
- Case studies:
 - 1. Enhancing the Processing of Baked Tortilla Chips
 - 2. Enhancing the Texture of Baked Tortilla Chips
 - 3. Reducing the Breakage of Baked Tortilla Chips
 - 4. Using Pulses in Baked Tortilla Chips



A close-up photograph of a red ceramic bowl filled with golden-brown, triangular tortilla chips. A white, creamy dip is visible in the center of the bowl, partially covered by the chips. The background is a soft-focus red surface.

Overview of the snack market

Snack volumes and NPD



North America **1 of 2**
markets with the highest volumes
in snacks²



The U.S. leads in sales volume
and value, and accounts for
greatest portion of snack
activity²

14.2%

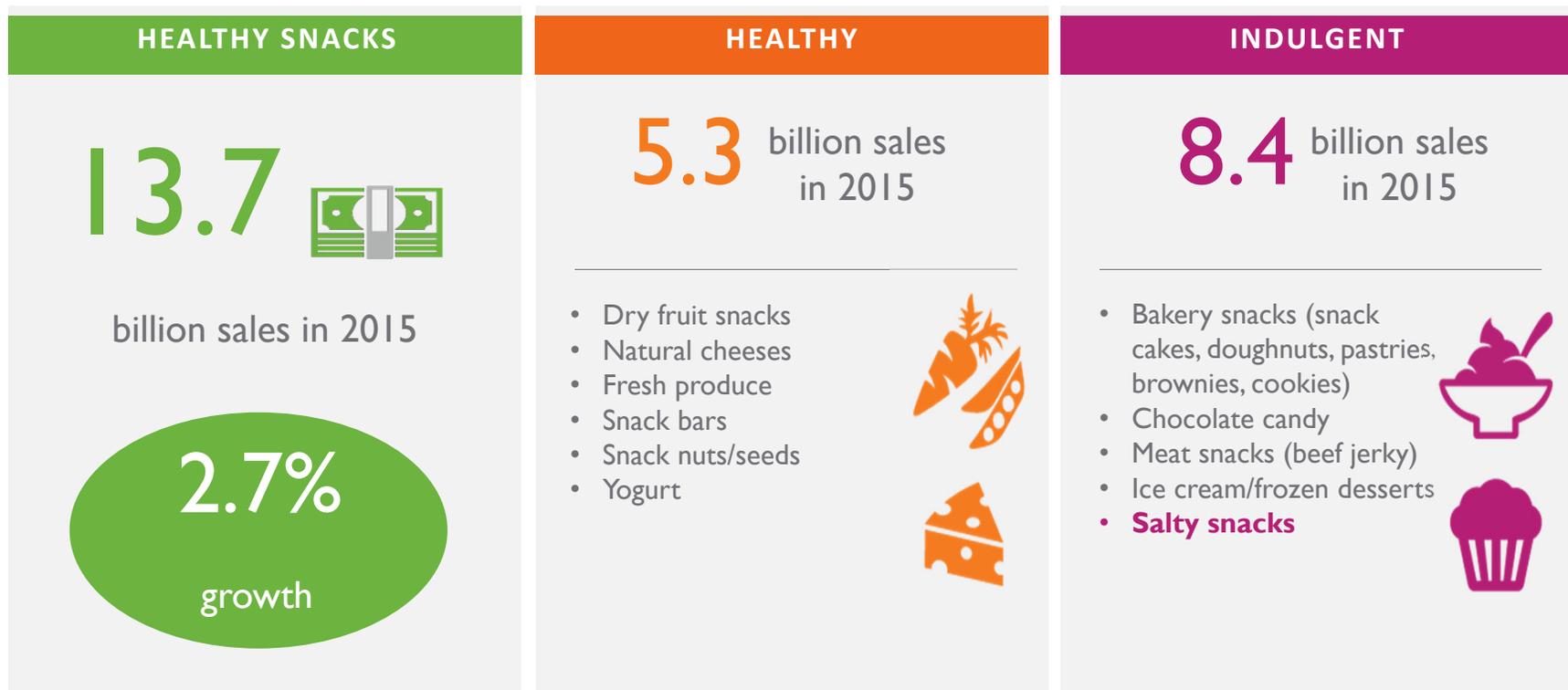
CAGR growth of NPD activity
in U.S. snack market in the past
5 years²

4%

expected annual revenue
market growth
(CAGR 2018–2021)¹

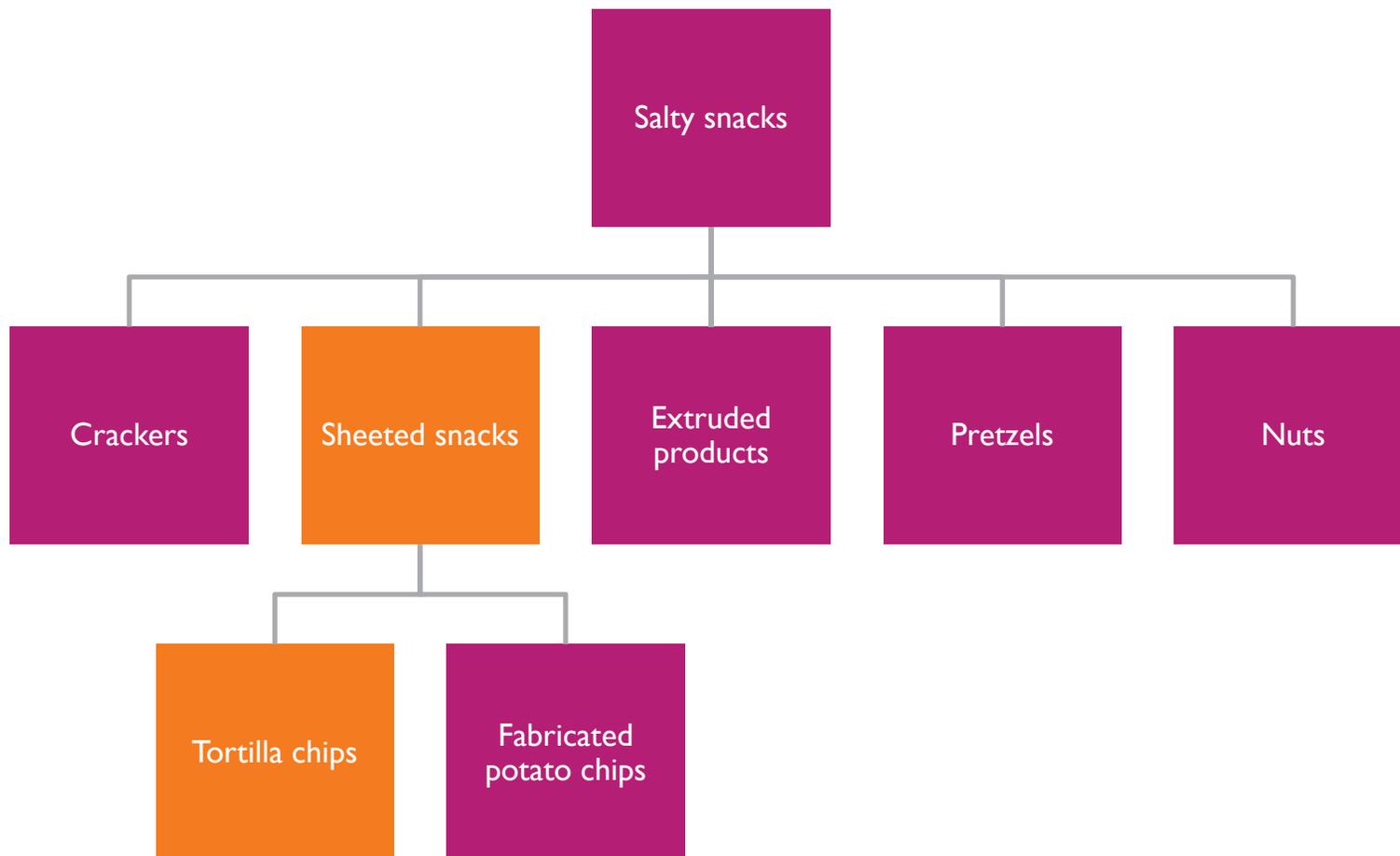
Sources: ¹ Consumer Market Outlook, Statista, 2018. ² Global Snacks Report, Innova, 2018.

Indulgent snacks slightly outpacing healthy snacks



Source: 2015 Full Year - IRI Multi-Outlet Sales Report

Landscape of snack products



IRI 2017 data on tortilla chips category for volume & sales

Category	2017 Sales (M)	% Change vs PY	2017 Volume (lbs. in M)	% Change vs PY
Potato Chips	5,558.4	0.2	1,169.9	-1.3
Tortilla/Tostada Chips	4,064.6	1.5	1,049.3	1.1
Other Salted Snacks (no nuts)	3,407.6	9.4	622.8	7.9
Cheese Snacks	1,527.9	7.1	292.9	1.6
Pretzels	932.5	1.9	283	0.4
Ready to eat popcorn/Caramel Corn	1,088.4	4.1	163	1.7
Pork Rinds	250.7	14.3	32.7	14

A close-up photograph of a red ceramic bowl filled with golden-brown tortilla chips. A white, creamy dip is visible in the center of the bowl, partially covered by the chips. The background is a soft-focus red surface.

Recent launches on tortilla chips

Seasoning



Late July Snacks **Bacon Habanero**
Clasico Tortilla Chips



Wholesome Pantry Organic
Pumpkin Spice Tortilla Chips



Al Chipino **NY Deli Cheese**
Tortilla Chips



Al Chipino Barbecue **Tikka Masala**
Tortilla Chips



Gold Emblem About **Nacho**
Cheese Tortilla Chips



Jacksons Honest **Salsa Fresca**
Tortilla Chips Slow

Source: Innova Market Insights 2018

Color



Earth Fare Organic **Blue** Corn Tortilla Chips



Wholesome Pantry Organic **White** Corn Tortilla Chips



Food Lion **Yellow** Corn Tortilla Chips



Jackson's Honest **Red** Corn Sprouted Tortilla Chips Slow Cooked With Coconut Oil



RW Garcia Mixt Bag **Yellow And Blue** Tortilla Chips



Que Pasa Liberty Organic **White, Red, and Blue** Tortilla Chips

Source: Innova Market Insights 2018

Multigrain



Late July Snacks Organic Chia
And Quinoa Tortilla Chips

**Chia seeds and quinoa
seeds**



Wegmans Multi-Grain Round
Tortilla Chips

**Whole oat flour, whole
buckwheat flour, and
buckwheat fiber**



Utz Gluten Free Multigrain
Dipping Tortillas

**Flaxseeds, sesame seeds,
sunflower seeds, quinoa, corn and
brown rice**

Shape & Thickness



Doritos Dinamita: **Rolled**
Corn Tortilla Chips



Fresh Thyme Farmers
Organic Blue **Triangle**
Tortilla Chips



Wegmans 100% White Corn
Bite-Size **Round** Tortilla Chips



Tostitos Baked **Scoops**
Tortilla Chips



Fresh Thyme Farmers Organic
White **Thin** Tortilla Chips



El Sabroso Cantina Especial
Thick Tortilla Chips



Mission Tortilla **Strips**



Tostitos Original **Football**
Shaped Tortilla Chips

Corn alternatives



Beanitos **White Bean Chips** Skinny Dippers Hint of Lime



Beanfields Sea Salt **Bean And Rice Chips**



Quest Tortilla Style **Protein Chips** With Ranch Flavor



Wholesome Pantry Organic **Sweet Potato** Tortilla Chips



Wildroots **Red Quinoa And Chia** Tortilla Chips



The Real Coconut **Coconut Flour** Tortilla Chips: Beach Barbeque

Source: Innova Market Insights 2018



Consumer preference study

Consumer preference study

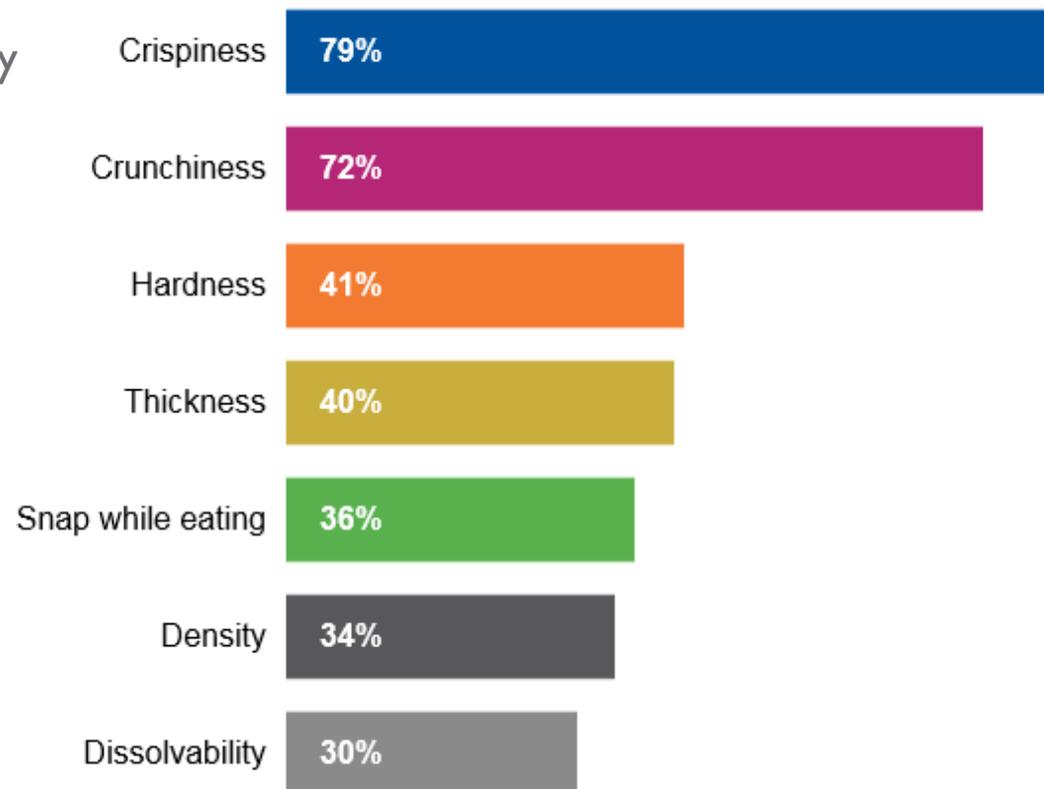
- Year of the study:
 - 2018
- Number of people asked:
 - 520



Participant profile	%
Age	
18-34	31
35-54	40
55+	29
Gender	
Male	49
Female	51
Number of children	
None	69
I+ Child	31
Race	
White	78
Non-white	24
Household Income	
Less than \$50K	48
\$50K – less than \$100K	34
\$100 plus	17

Top textural attributes in tortilla chips

- In tortilla chips crispiness is key and crunch comes in a close second.
- Thinner tortilla chips are 54% more popular than thick ones.
- The same number of consumers want a quiet snap while eating as want a loud snap with every bite.



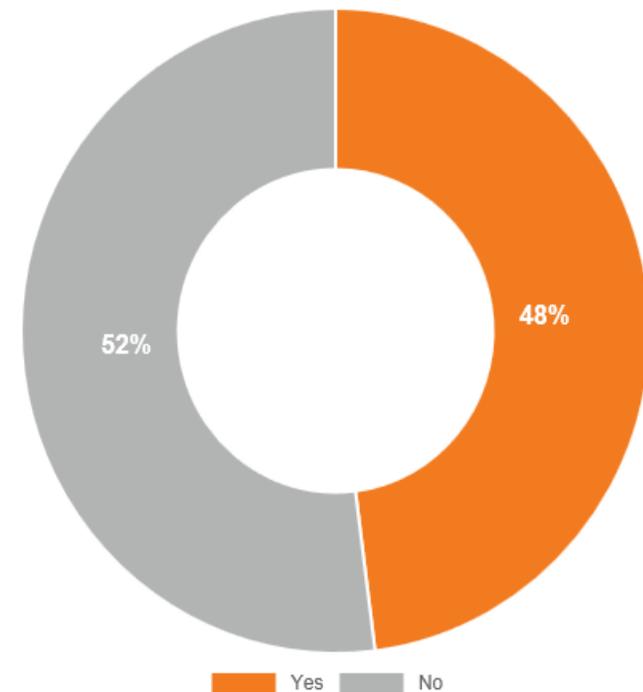
Simply loved snacks

- Most consumers (59%) read the ingredients list before buying a bag of tortilla chips. For 80% of consumers, that ingredient list is at least somewhat important in their purchasing decisions
- Tortilla chip consumers generally prefer clean label products, and more than half are willing to sacrifice texture to keep labels clean

Tortilla chip consumers associate “clean label” with:

- “*Real ingredients*”
- “*No preservatives*”
- “*No additives*”
- “*An all-natural product*”

Willing to accept modified ingredients for ideal texture?

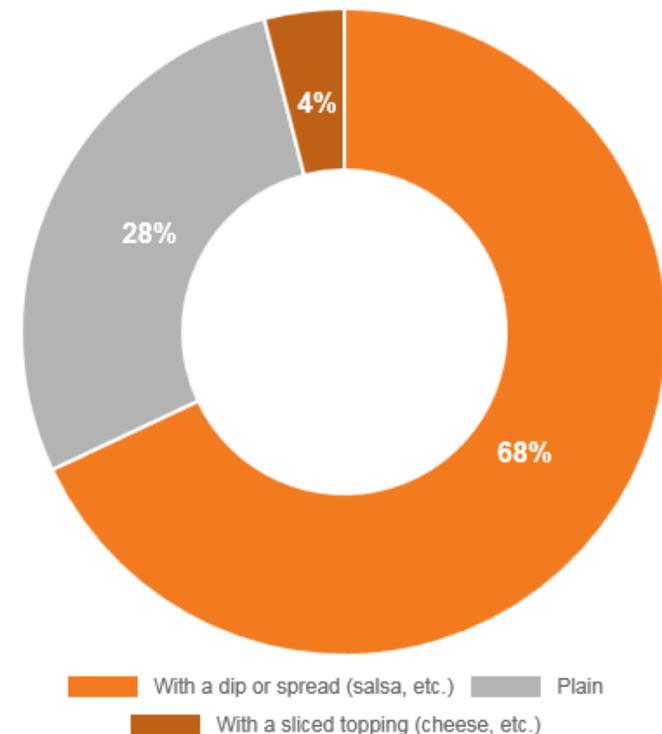


Snacking habits

- Virtually all consumers (95%) eat their tortilla chips at home, and more than two-thirds eat them with a dip or spread.

More than half (55%) of consumers really like their current tortilla chips, and only 15% prioritize price when making a purchase decision –the rest just want a great eating experience.

How tortilla chips are eaten

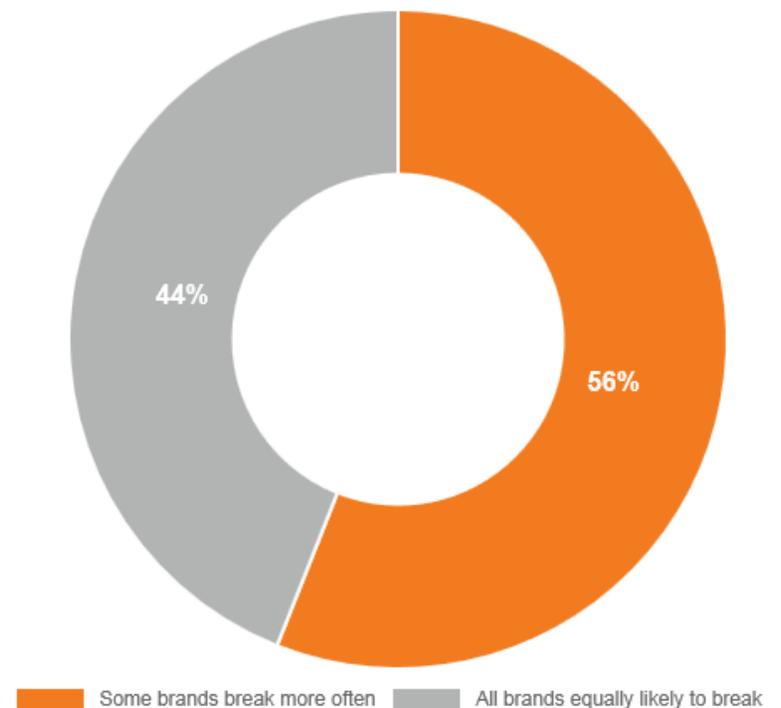


More snacking, less breakage

- For most consumers (84%), finding unbroken tortilla chips when they open a bag is at least somewhat important. Just over half, however, think some brands of tortilla chips are more likely to break than others.

Half of tortilla chip consumers always find at least some broken chips in the bag. However, the breakage is usually less than a quarter of the total package.

Do some tortilla chips break more easily than others?



Baked versus fried tortilla chips



What is a tortilla chip?

- Typically derived from corn masa, which is made by gently cooking corn in the presence of lime, or $\text{Ca}(\text{OH})_2$ and stone grinding
 - Fresh masa can be immediately made into tortilla products
 - Can be dried to flour at various particle sizes
- Traditional chips are formed by masa dough and then sheeted thinly (typically ~1 mm).
 - Fried chips are toasted prior to frying to reduce moisture and develop flavor/color
 - Oil content typically 20-25% of final chip
 - Seasoned with salt or other flavors
- *Baked* tortilla chips offer nutritional benefits
 - Products are toasted and then dried to approximately 2% moisture
 - Approximately 5-10% oil sprayed on to adhere salt/seasoning
 - Significantly less fat than traditional fried tortilla chips

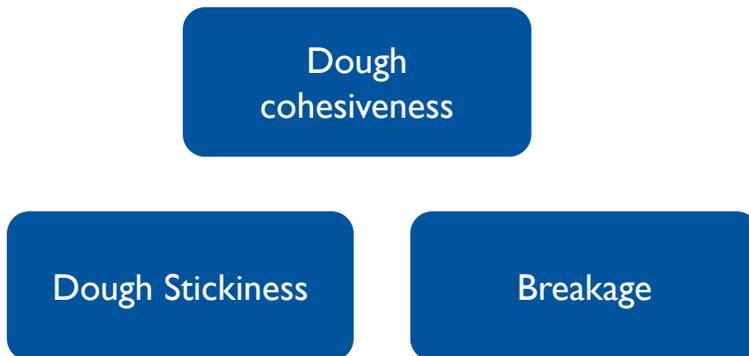
Differences Between Baked versus Fried Tortilla Chips

- While baked tortilla chips have significant benefits from a **nutritional** standpoint, there are challenges from a **texture** standpoint
- *Baked* tortilla chips are very different from *traditional fried* tortilla chips in these main attributes:
 - *Volume of Sound*
 - *Dissolvability*
 - *Moistness*



Challenges in Baked Tortilla Chips

Manufacturing Challenges



Inconsistent Product
Quality

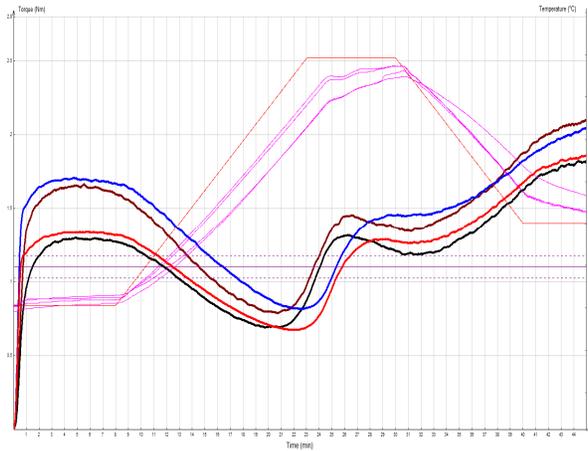
Texture Challenges



Reduced Purchase Intent

Starch Effects on Different Applications

Baked Tortilla Chips



Dough Formation

- Starch type alters water requirements
- Hydration time
- Impacts dough strength and softness

Sheeting

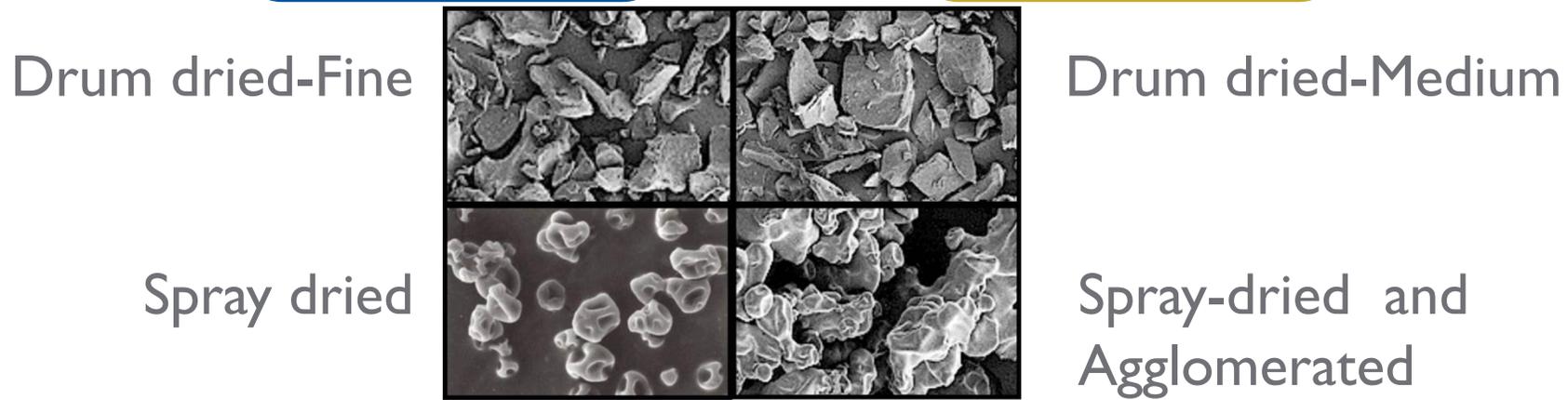
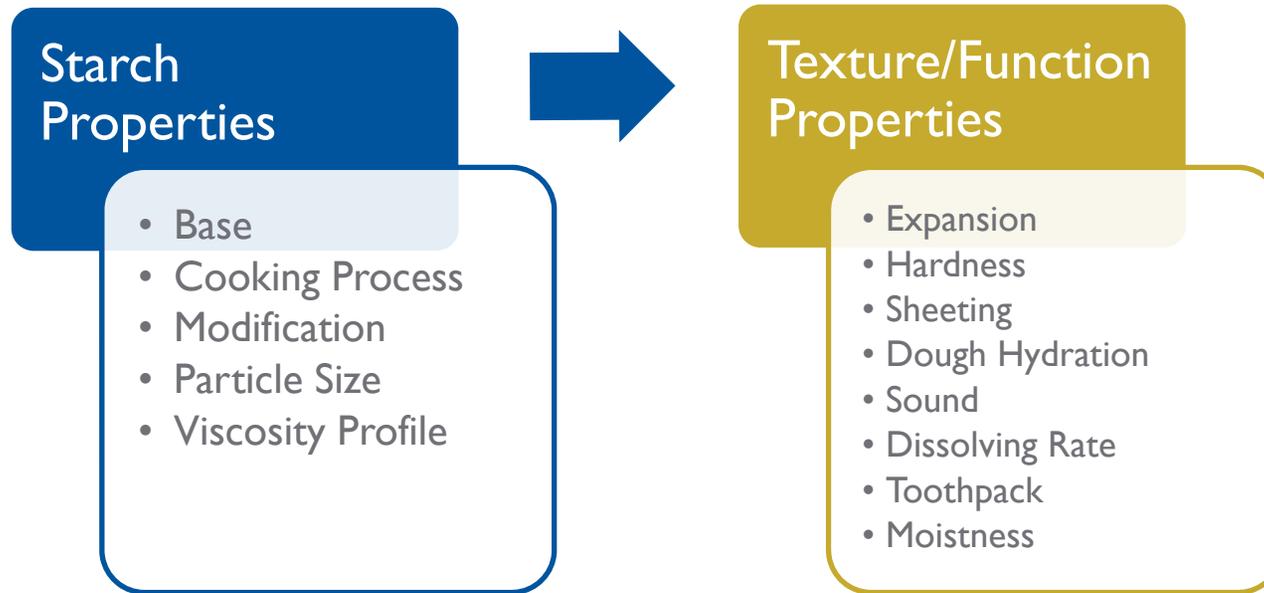
- Starch selection can influence sheeting to make sheet more cohesive
- Modifies sheet stickiness
- Alters sheeting performance

Texture

- Hardness
- Dissolvability
- Sound Quality



Starch functionality





Case study I: Enhancing the Processing of
Baked Tortilla Chips

Formula and Process

Formula	%
Corn Masa Flour	46
Corn Grits	4
Specialty Starch	4
Salt	1
Water	45
Total	100

1. Dry ingredients weighted into mixer
2. Dry ingredients mixed for 1 minute. Water added to bowl and masa mixed for 5 minutes under medium speed. Dough consistency was checked, and more water was added if necessary.
3. Dough transferred to sheeting line
4. 3-crackdown sheeting process followed. First crackdown reduced dough sheet to 6.0 mm. Second crackdown reduced to 3.0 mm. Final gauge sheeter reduced thickness to approximately 1.0 mm. Product cut into hexagon shapes
5. Product sent through two-zone convection oven under following conditions: Zone 1: 510° F with 10% exhaust, Zone 2: 425° F with 100% exhaust. Total bake time is 2 minutes
6. Product sent through dryer under following conditions: 260° F for 22 minutes.
7. Oiling and salting.

Understanding Dough Properties: Controlling Stickiness and Firmness



Drum Dried Waxy-based
Ingredients



Tapioca-based material

- Starch selection can play critical role in sheetability of dough
- Understanding impact of starch selection on dough properties is key to balancing the right texture with an optimized process

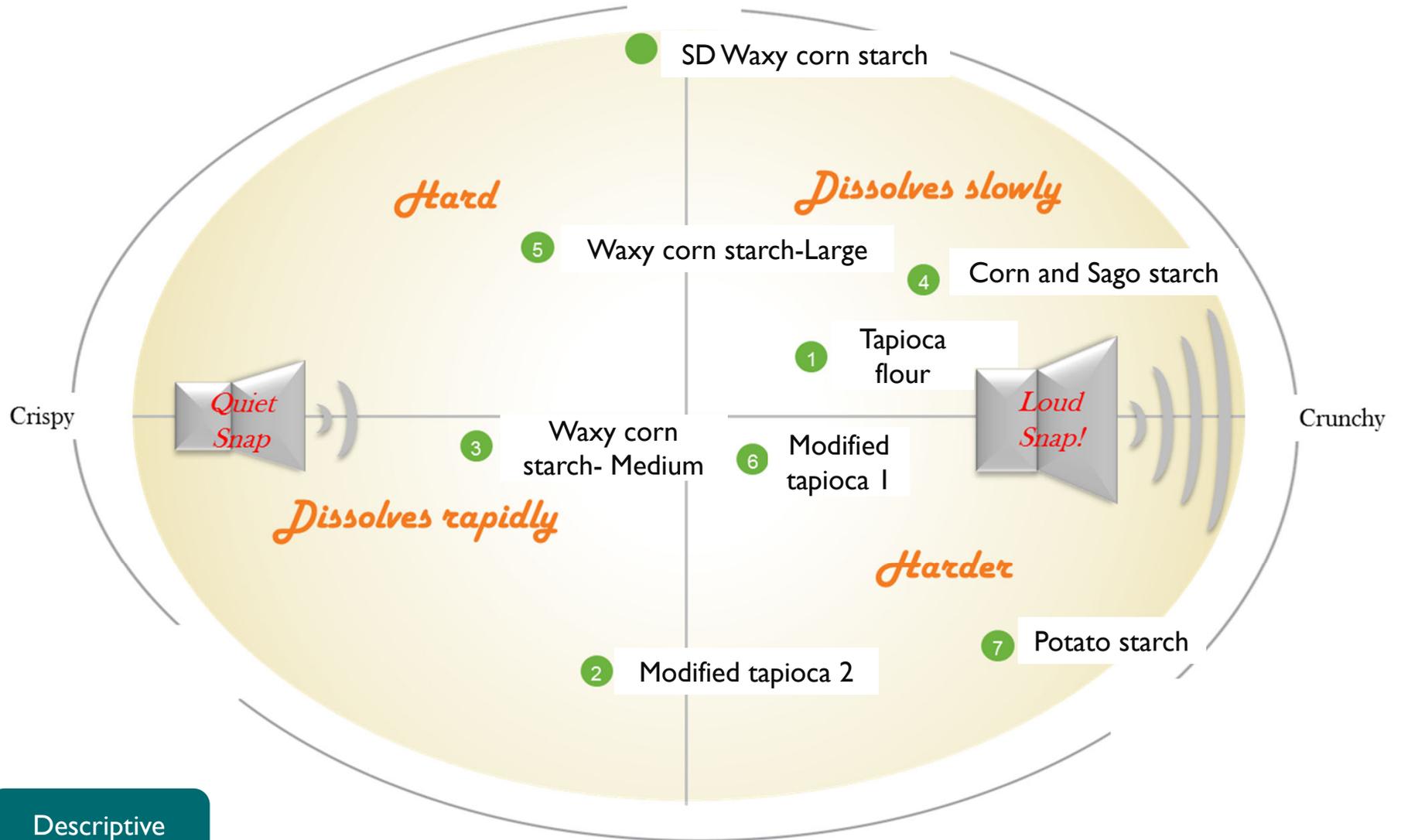
Sheeting Properties of Starch Texturizers

Product	Stickiness	Dough Toughness	Sheeting
Waxy corn starch-Medium particle size	+++	++	+++
Waxy corn starch-Large particle size	++	+	++
Modified tapioca starch-1	+	+	++++
Modified tapioca starch-2	+	+	++++
Tapioca flour	+	+++	+++
Corn and Sago starch	++	+++	++
Potato starch	+	+	+++



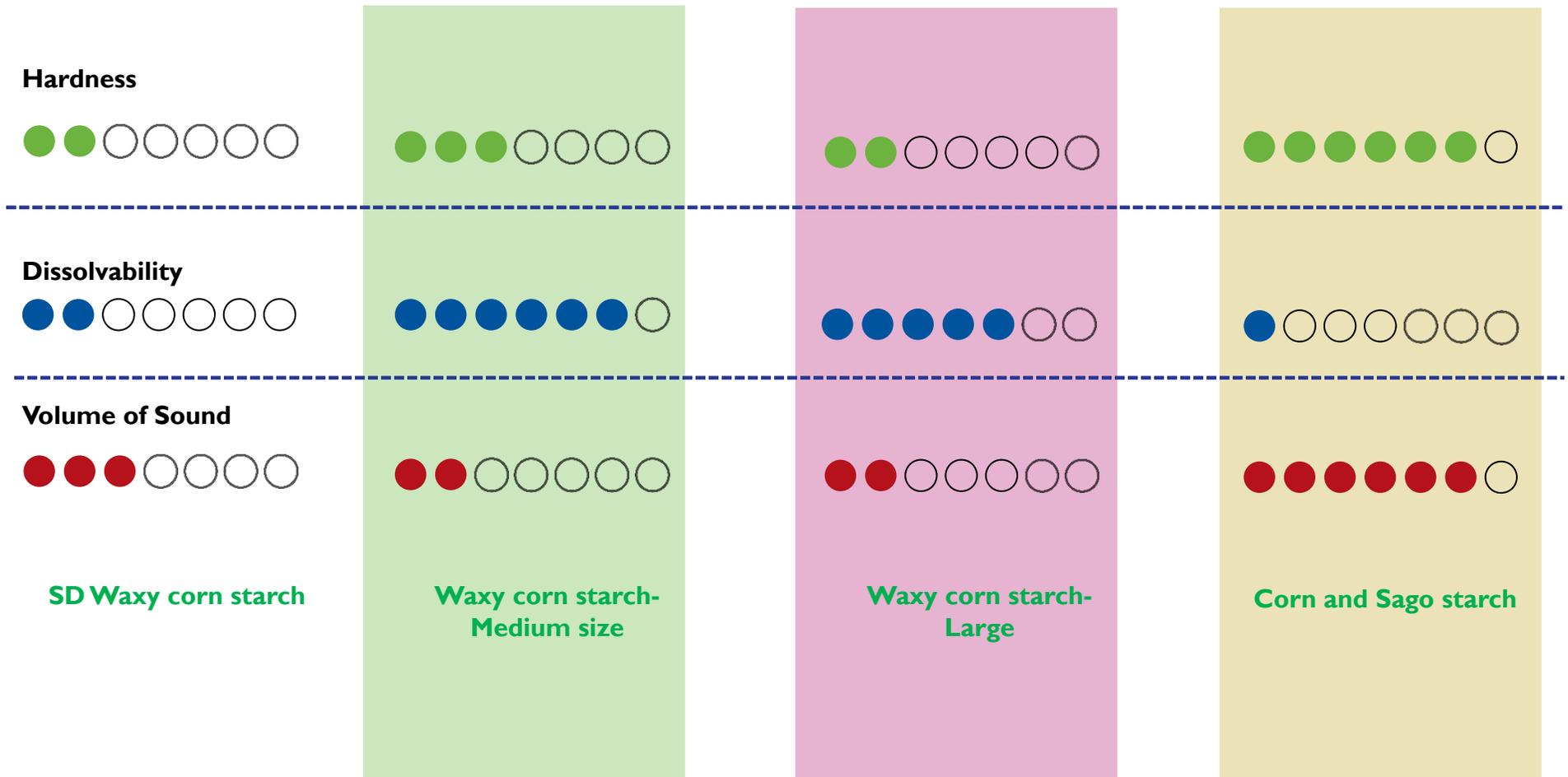
Case study 2: Enhancing the Texture of Baked
Tortilla Chips

Baked Tortilla Chips

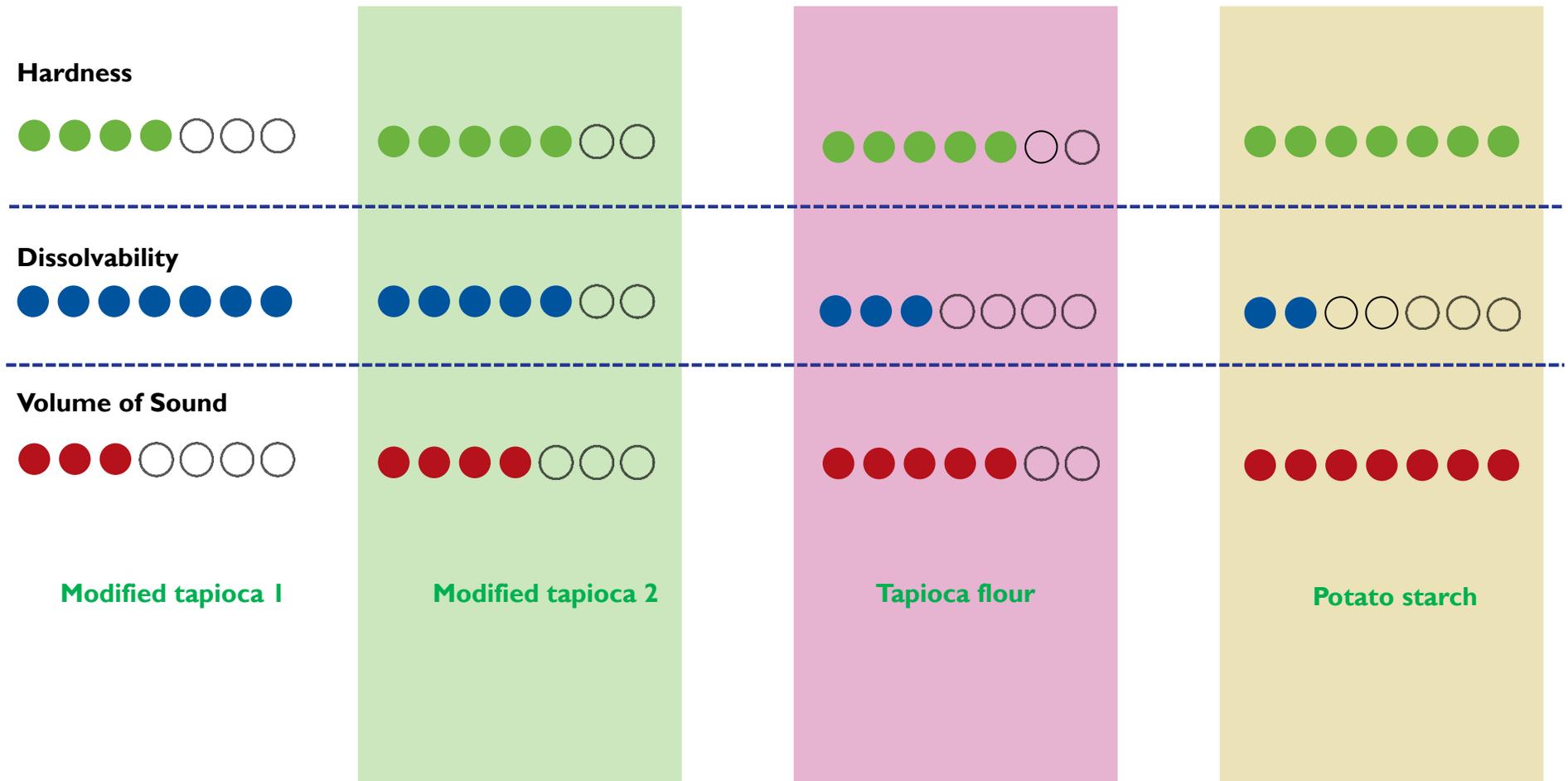


Descriptive
Sensory Analysis

Moving the Texture Dial with Starches



Moving the Texture Dial with Starches

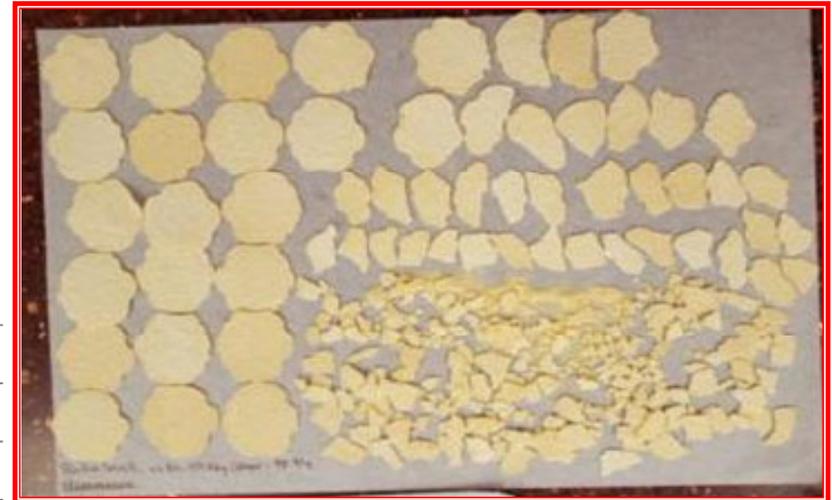
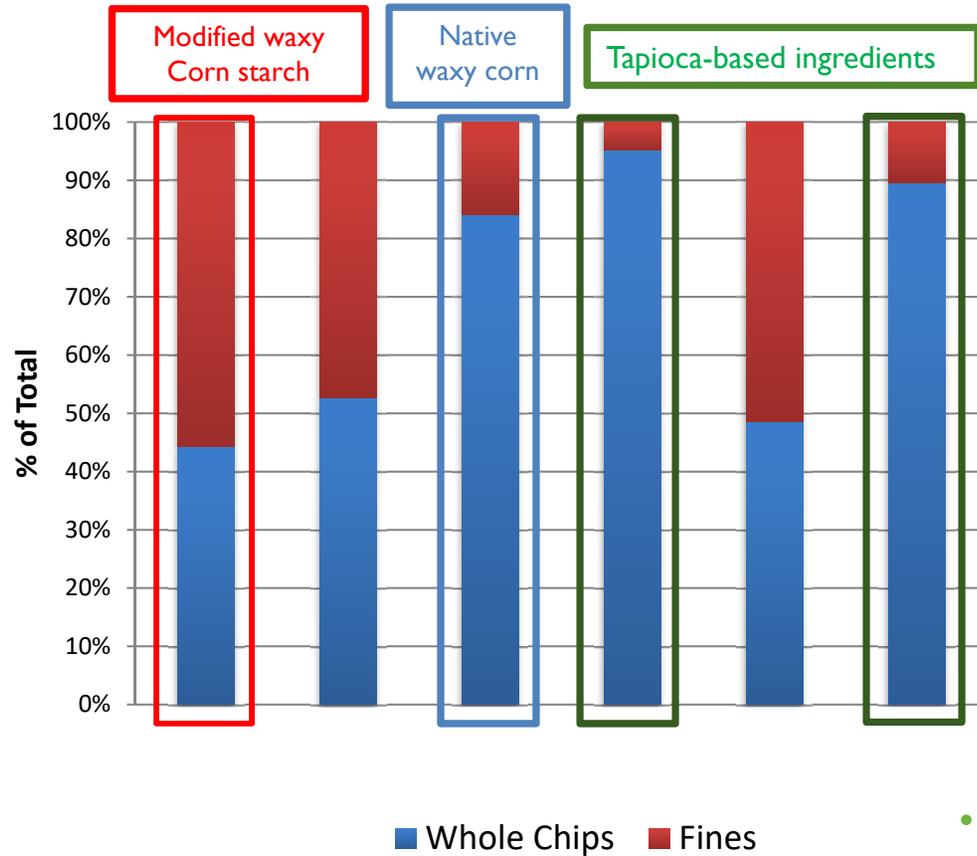




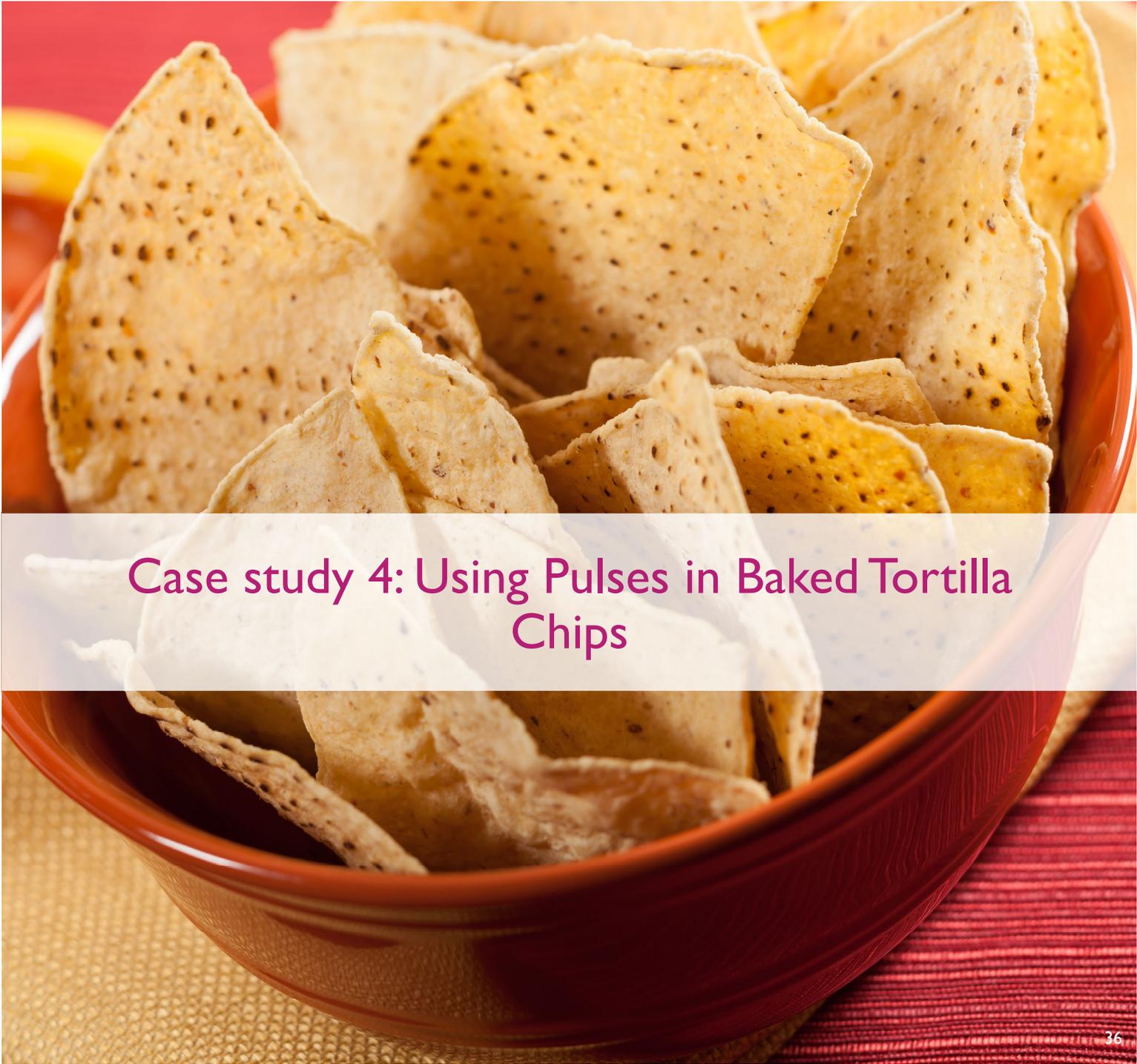
Case study 3: Reducing the Breakage of Baked
Tortilla Chips

Reduced Breakage

Breakage Data on Selected Prototypes



- Ability to increase chip retention via formulation



Case study 4: Using Pulses in Baked Tortilla Chips

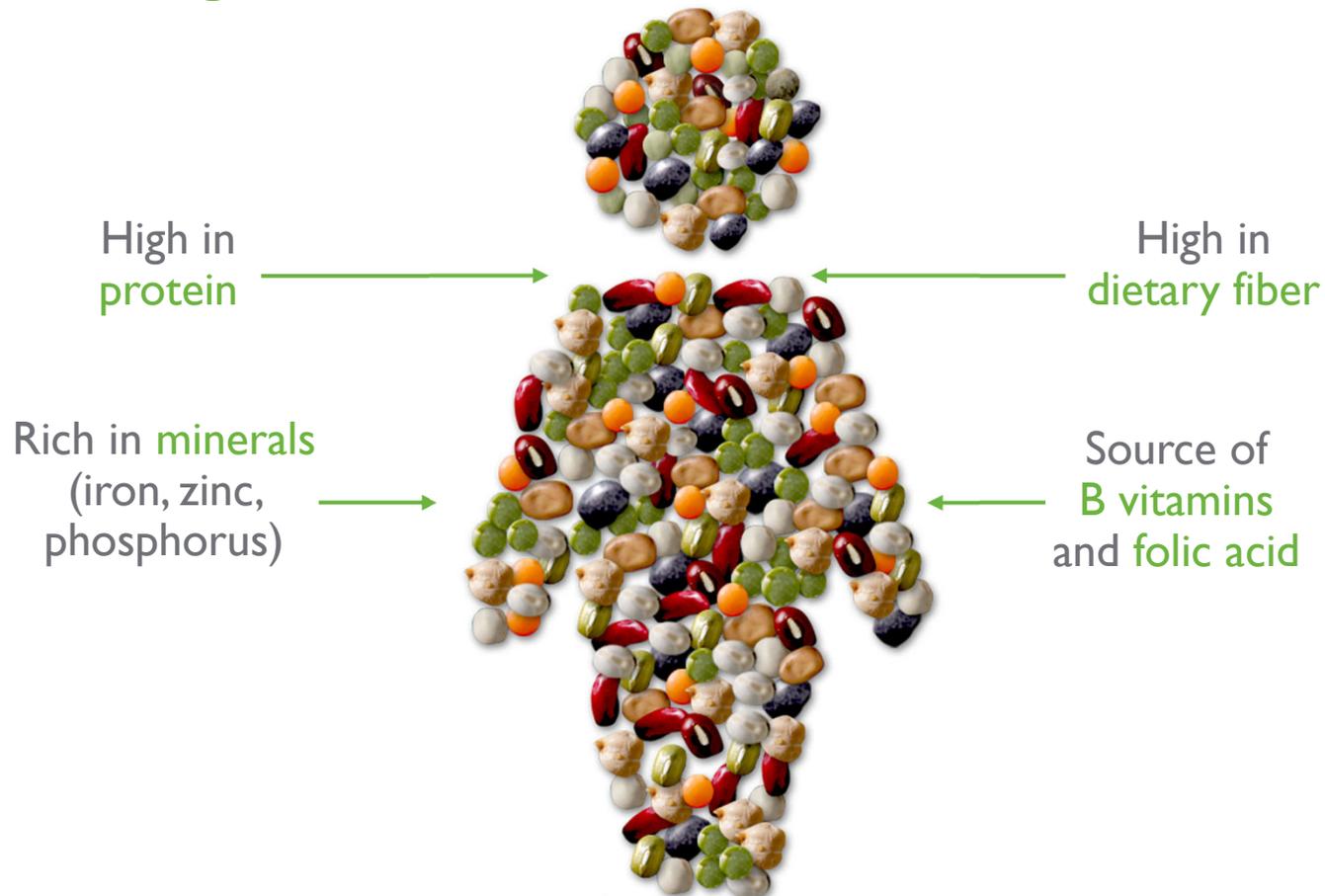
What are pulses?

Pulses are the **dried seeds of plants in the legume family.**
They include:

- Peas
- Beans
- Lentils
- Chickpeas

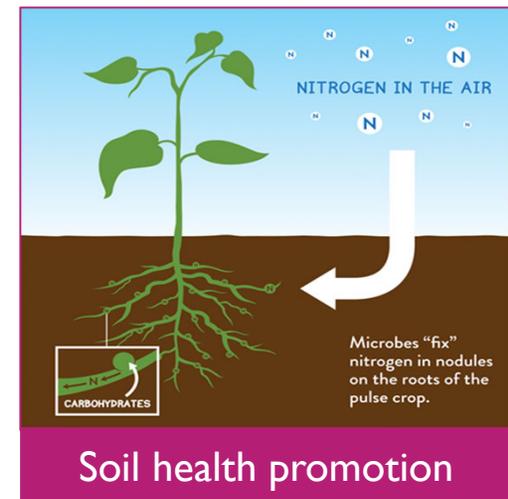
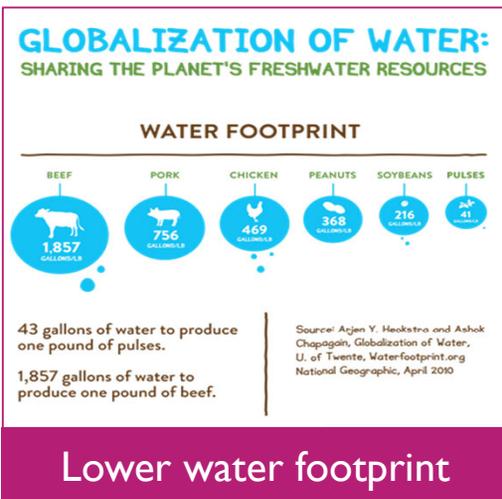


What's so good about Pulses?



ENRICHMENT BENEFITS

Sustainability benefits of pulses



Source: www.pulses.org, Pulse Canada, PETA

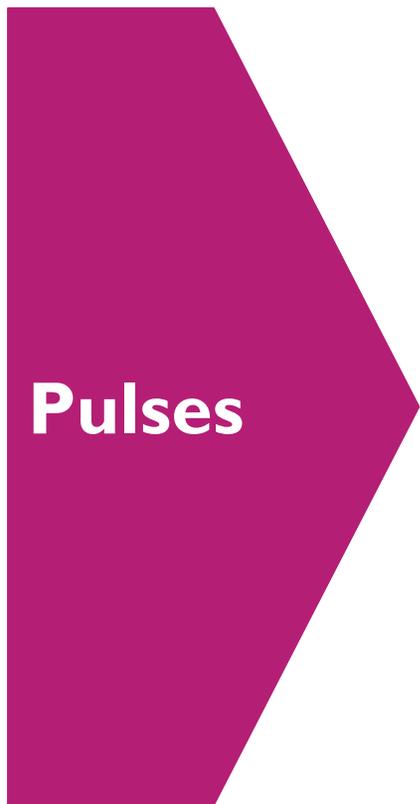
Health Institutions are endorsing pulses

Plant Protein

Many respected health institutions are recommending the reduction of animal based products and the increase of plant based foods, including pulses.

- American Heart Association
- Academy of Nutrition and Dietetics
- American Institute for Cancer Research
- World Health Organization
- FDA/Dietary Guidelines Board
- Food and Agricultural Organization

Manufacturers are launching with pulses and additional plant based protein sources



It can be hard to eat well when you're always on the go, especially if you are looking for plant-based nutrition. This bar is loaded with 13g of hunger-fighting protein, made with plant-based ingredients, and has 5g of sugar. With the refreshing taste of mint covered in rich dark chocolate, each bite tastes as good as it is good for you.

Pulse chip recipe

Ingredient	True %
Chickpea flour	32.36
Faba bean protein concentrate	32.36
Water	26.21
Oil	5.18
Tapioca starch	3.24
Salt	0.65
TOTAL	100

- Excellent sheeting no tearing and stickiness during sheeting
- Increased protein and fiber content of the chip

Nutrition Facts	
Serving Size (28g)	
Servings Per Container	
Amount Per Serving	
Calories 130	Calories from Fat 30
% Daily Value*	
Total Fat 3.5g	5%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 105mg	4%
Total Carbohydrate 10g	3%
Dietary Fiber 1g	4%
Sugars 0g	
Protein 10g	
Vitamin A 0%	• Vitamin C 0%
Calcium 4%	• Iron 8%
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
	Calories: 2,000 2,500
Total Fat	Less than 65g 80g
Saturated Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g
Calories per gram:	
Fat 9 • Carbohydrate 4 • Protein 4	

Key Takeaways

- The consumption of snacks in general, and of tortilla chips in particular is growing steadily every year
- Tortilla chips can be found in many flavors, colors, shapes, made out of a wide variety of ingredients, and can be cooked by frying or baking
- Baked tortilla chips have significant lower fat content than fried tortilla chips, but their processing, texture, and post cooking breakage can be a challenge
- Selecting the right type of starch is key to improve the processing, help to reach the right texture, and reduce the breaking of the baked tortilla chips
- Pulse flours and proteins can be used to create baked tortilla chips alternatives that provide enhanced nutritional value



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THANK YOU!

QUESTIONS???

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IDEAS TO SOLUTIONS

