



UNLOCKING THE FULL POTENTIAL OF ENZYMES IN TORTILLAS

From Cost to Unlocking Real Value

TIA Nashville, TN September 2026

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AGENDA

Unlocking the Full Potential of Enzymes in Tortillas

1

New to the Stage, Not New to Tortillas

2

Unlocking Value with Enzymes

3

How to Think about Cost

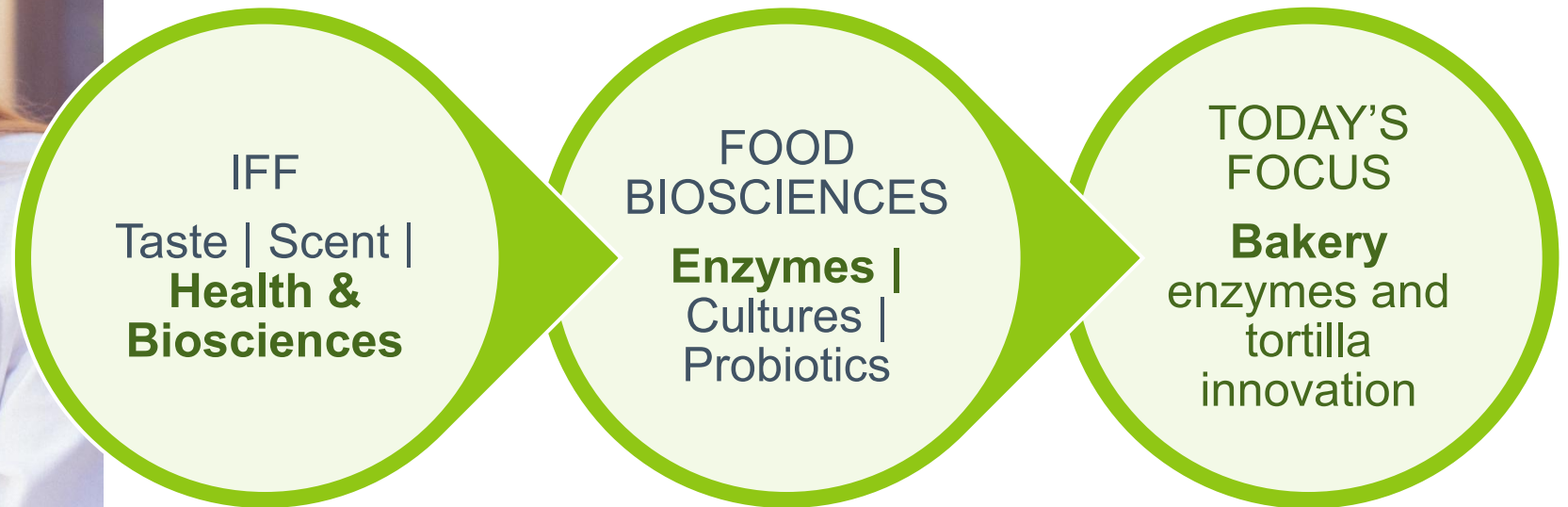
**NEW TO THE
STAGE
NOT NEW TO
TORTILLAS**





IFF FOOD BIOSCIENCES

The bioscience expertise within IFF helping transform food and beverage



Applying the power of bioscience
to food and beverage challenges

IFF FOOD BIOSCIENCES BAKERY ENZYMES EXPERTISE

IFF is the innovator and producer of the enzymes behind these brands, backed by decades of bioscience expertise.

Dough
Strengthening

POWERBAKE®
ENOVERA™

Anti-staling

POWERFRESH®
POWERSOFT®
POWERFLEX®
MAX-LIFE™

Flour
Standardization
and more...

GRINDAMYL® A
GRINDAMYL®
PLUSWEET G



WHAT CONSUMERS EXPECT FROM A TORTILLA TODAY - DIDN'T HAPPEN BY ACCIDENT.

IFF pioneered the G4 enzyme technology that helped make lasting freshness and foldability an everyday expectation.



PIONEERED

Original G4 enzyme technology for wheat tortillas



PROVEN

Softness, flexibility and freshness throughout shelf life



ADVANCED

Decades of enzyme expertise and close collaboration with tortilla manufacturers

**We are not entering the tortilla conversation.
We are continuing one we helped start.**



UNDERSTANDING THE EXAMPLES

This presentation focuses on the impact of G4-enzyme technology on tortilla performance.

Product examples are used to illustrate the functionality of the technology and should not be interpreted as specific product recommendations for all regions.

- Demonstrating the capabilities of G4-enzyme technology
- Illustrating functional outcomes in tortilla applications

The technology platform is global.

Commercial solutions may vary by region.

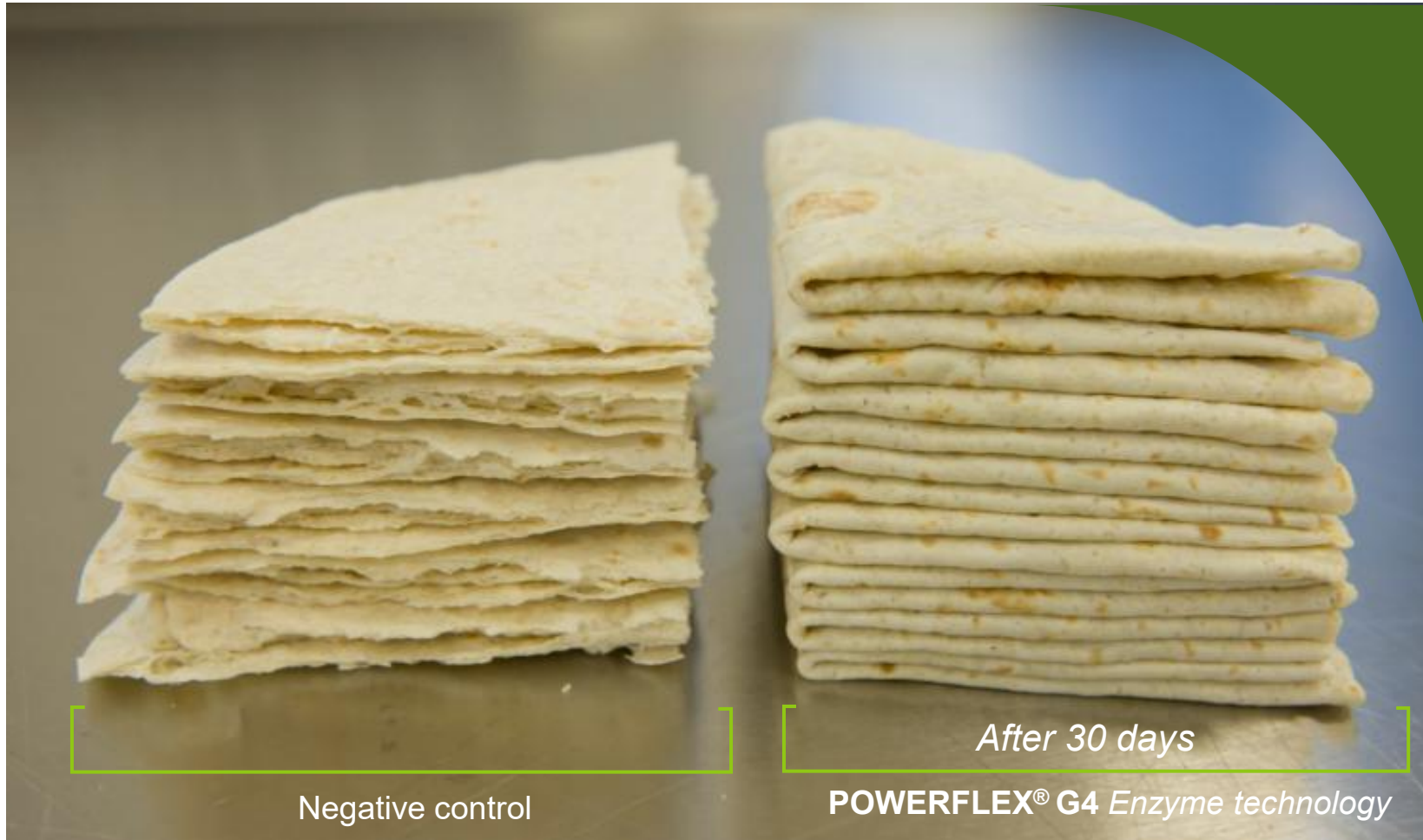
UNLOCKING VALUE WITH ENZYMES

01 | Softness & Pliability



THE G4 AMYLASES IN POWERFLEX®

At the core of tortilla Foldability

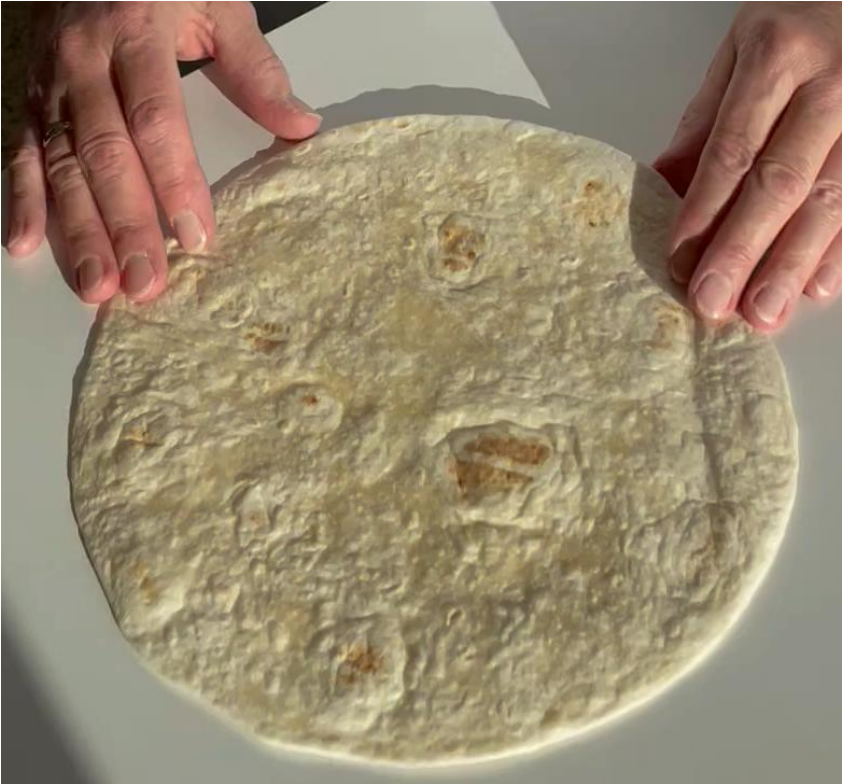


**Maintaining flexibility
throughout shelf life,
G4 amylases help:**

- ✓ preserve softness and foldability
- ✓ reduce cracking and breakage during storage

POWERFLEX® G4-enzyme technology

DEMO: DOUBLE-FOLDING TORTILLA



Optimised base recipe with hydrocolloids
and high levels of distilled monoglyceride



Same base recipe with
POWERFLEX® G4-technology

AMBIENT
TORTILLA

90 DAYS
SHELF-LIFE



POWERFLEX® ENZYME RANGE STREAMLINES PROCESSING AND DELIVERS SUPERIOR TORTILLAS

**POWERFLEX®
Enzyme Range**

Improve dough
pressability and
processability



Provides outstanding
softness, moistness
and flexibility



Minimize size
and shape
rejects

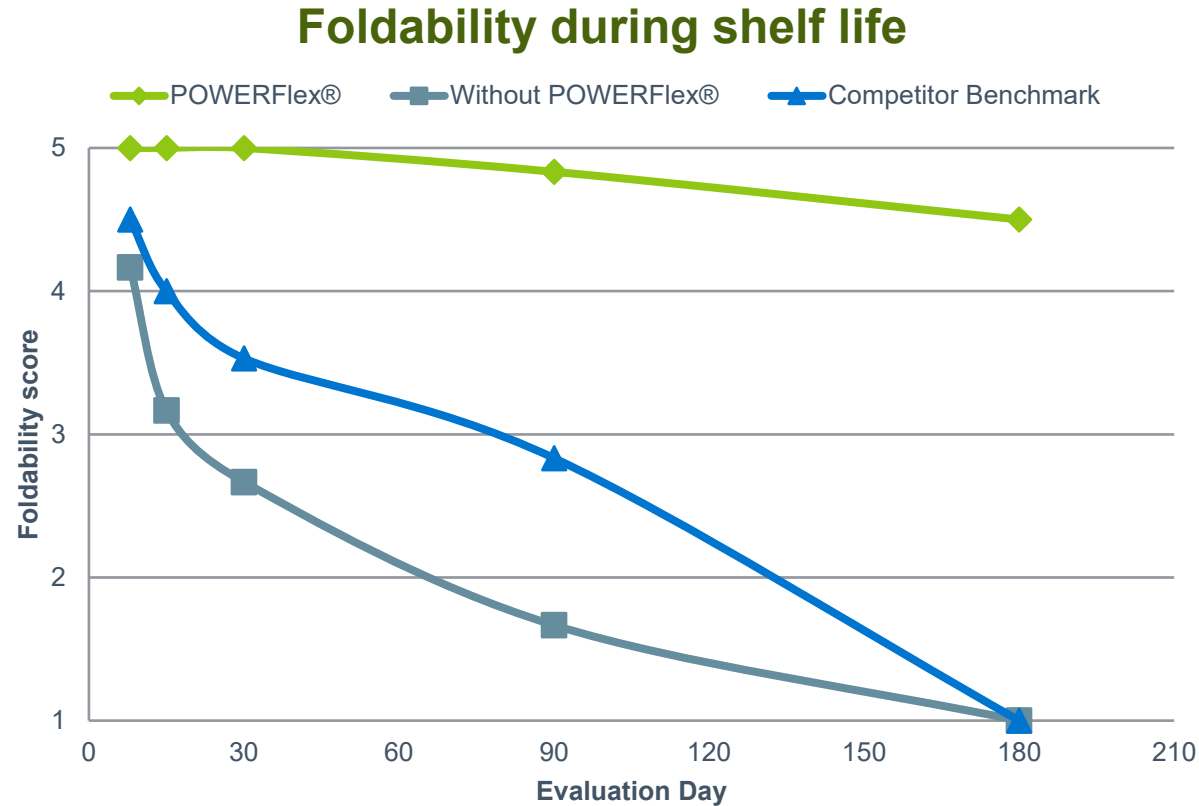


Maintains
shelf life for 6
to 9 months

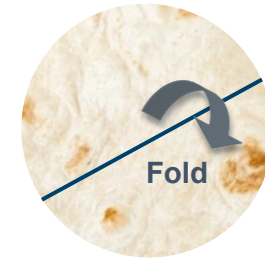




POWERFLEX® G4-ENZYME TECHNOLOGY CAN SUPPORT TORTILLA FRESHNESS TO 9 MONTHS



FOLDABILITY (scores explanation)



Does not break
score 5



Break less than 25%
score 4



Breaks between 25% and 50%
score 3



More than 50% breaks
score 2

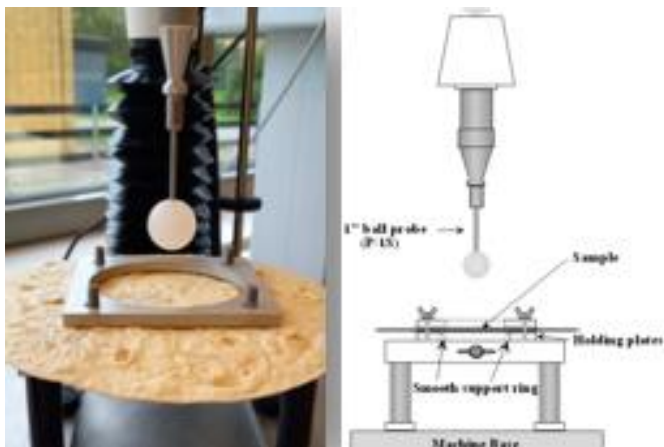
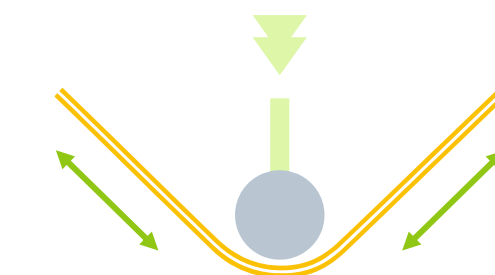


Breaks completely
score 1



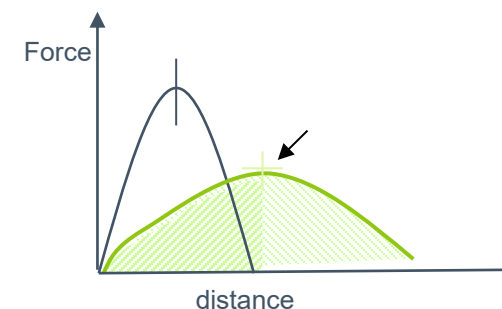
EXTENSIBILITY AND BREAK FORCE HOW TO MEASURE TORTILLA QUALITY

Texture Analyser Tortilla Rig from Stable Micro Systems®



Combination of:

- Folding (sphere probe curvature)
- puncturing (depending on probe size)
- tensile stress (stretching)



Derived parameters

- Breaking distance (mm) = extensibility
- Breaking force (g force or N)
- Partial work: $g \cdot mm$ (yielding point)
- Total work: total area under peak ($g \cdot mm$)

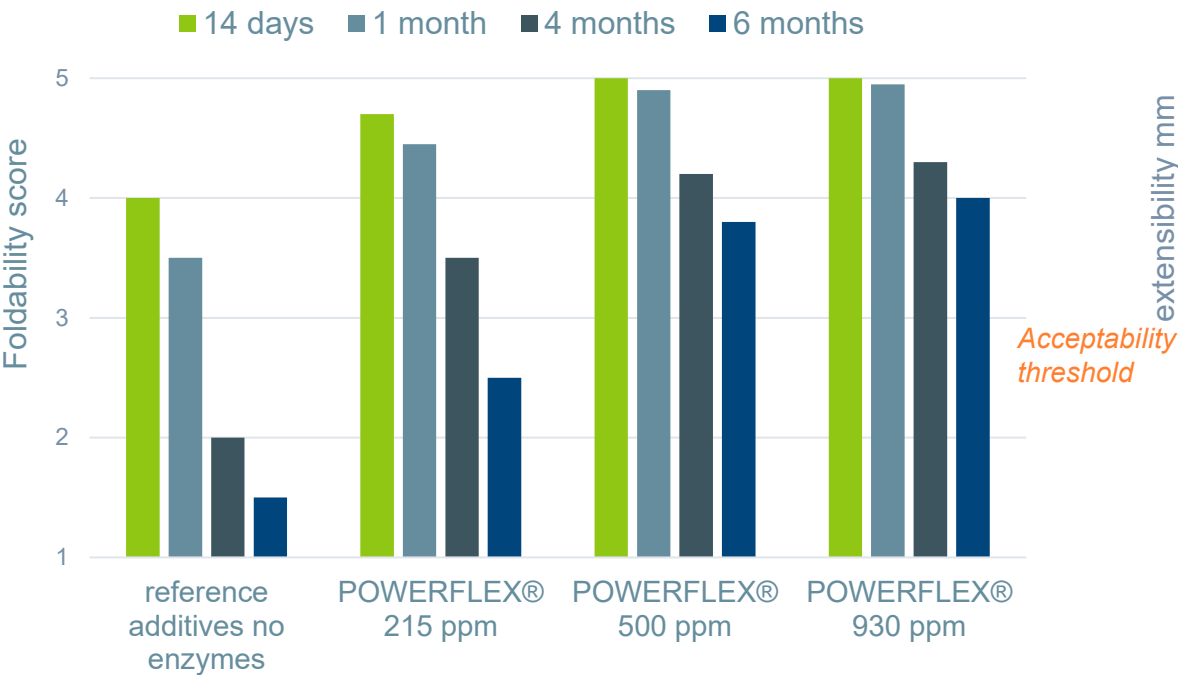
Tortilla freshness can be also measured instrumentally. This reduces the subjectivity of the assessment.
The extensibility is a valid parameter to describe and benchmark the evolution of freshness in tortilla during shelf life.



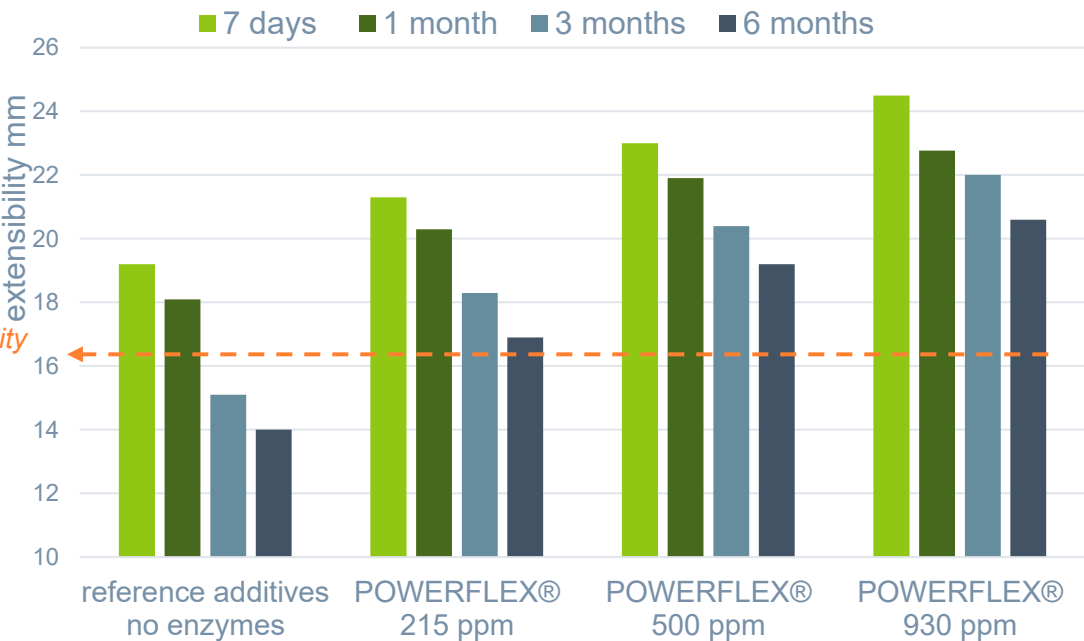
POWERFLEX® G4 ENZYME TECHNOLOGY

SHELF-LIFE STUDY: DOSE-RESPONSE

Manual folding



Instrumental: TA extensibility



Both foldability and extensibility values increase with increased enzyme dosage

Typical WHEAT TORTILLA Functional Ingredients

Typical WHEAT TORTILLA Functional Ingredients			Classic Tortilla Recipe	Simplified Recipe
Raising Agent	Sodium Bicarbonate	Aeration, crumb structure, translucency		
	Acidulant, Phosphates	Neutralization, color and aspect		
pH Corrector	Fumaric Acid	pH correction		
	Citric Acid	pH correction		
	Malic acid	pH correction		
Control a _w	Glycerin	aw control, plasticizer		
Preservatives	Potassium Sorbate	microbial control		
	Calcium Propionate	microbial control		
Emulsifiers	Distilled /Mono-di glycerides	freshness, adhesion, processability		
	SSL/DATM	freshness, processability		
Stabilizers	CMC	flexibility, adhesion, processability		
	Guar Gum	bite tenacity, strength		
	Xanthan Gum	Bite lightness, strength,		
Relaxants	L cyst, SMS, Inactivated Yeast	Pressability, diameter		
Processing aids	Enzymes	Freshness and processability		
TOTAL functional ingredients			8-10	6

-  Normally used
-  Optionally used
-  Simplification, label friendly* opportunity with POWERFLEX® enzyme technology

*: Label-friendly may have different meanings. In bakery, it is most commonly associated with the reduction or elimination of E-numbers and chemical additives

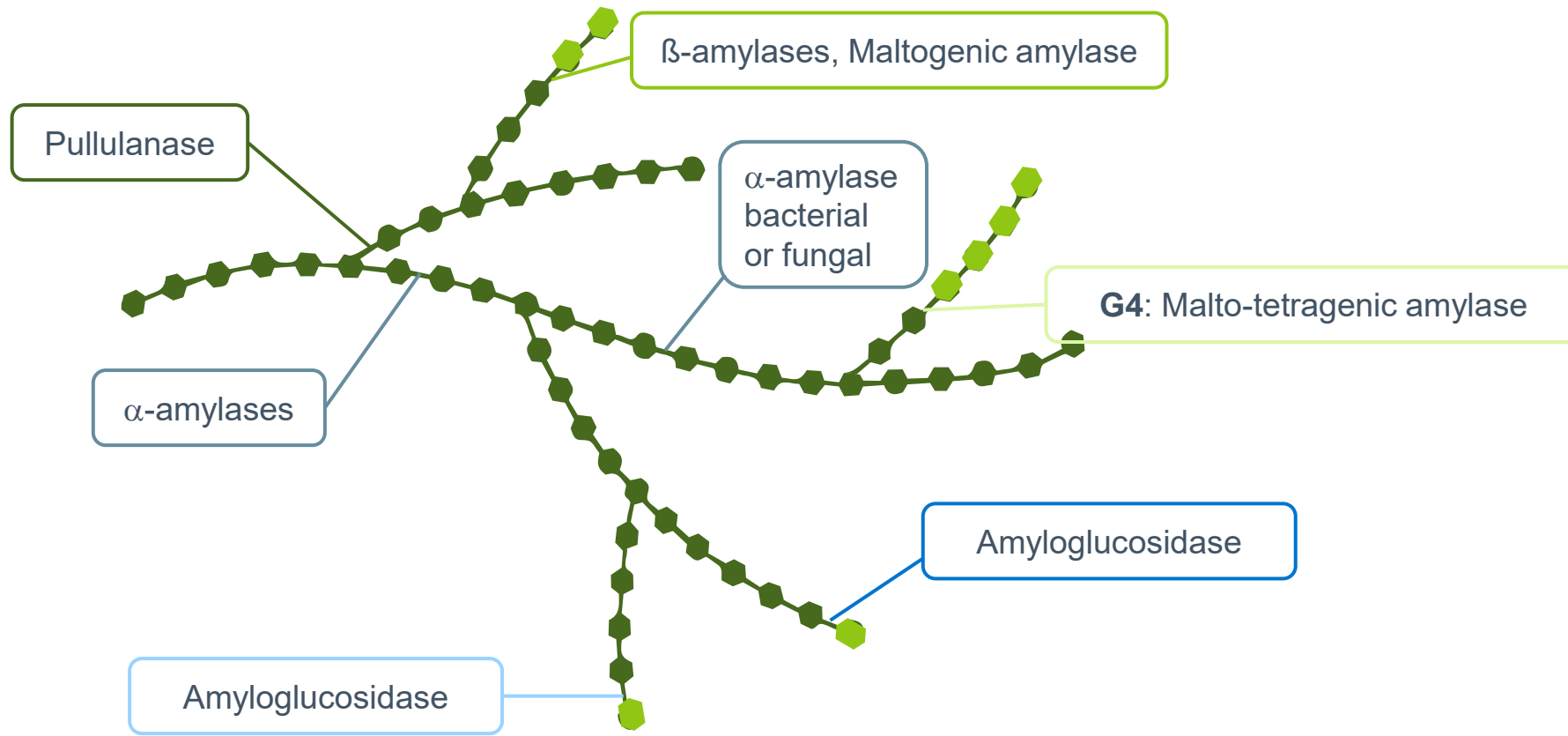
POWERFLEX® G4 ENZYME TECHNOLOGY: MECHANISM OF ACTION



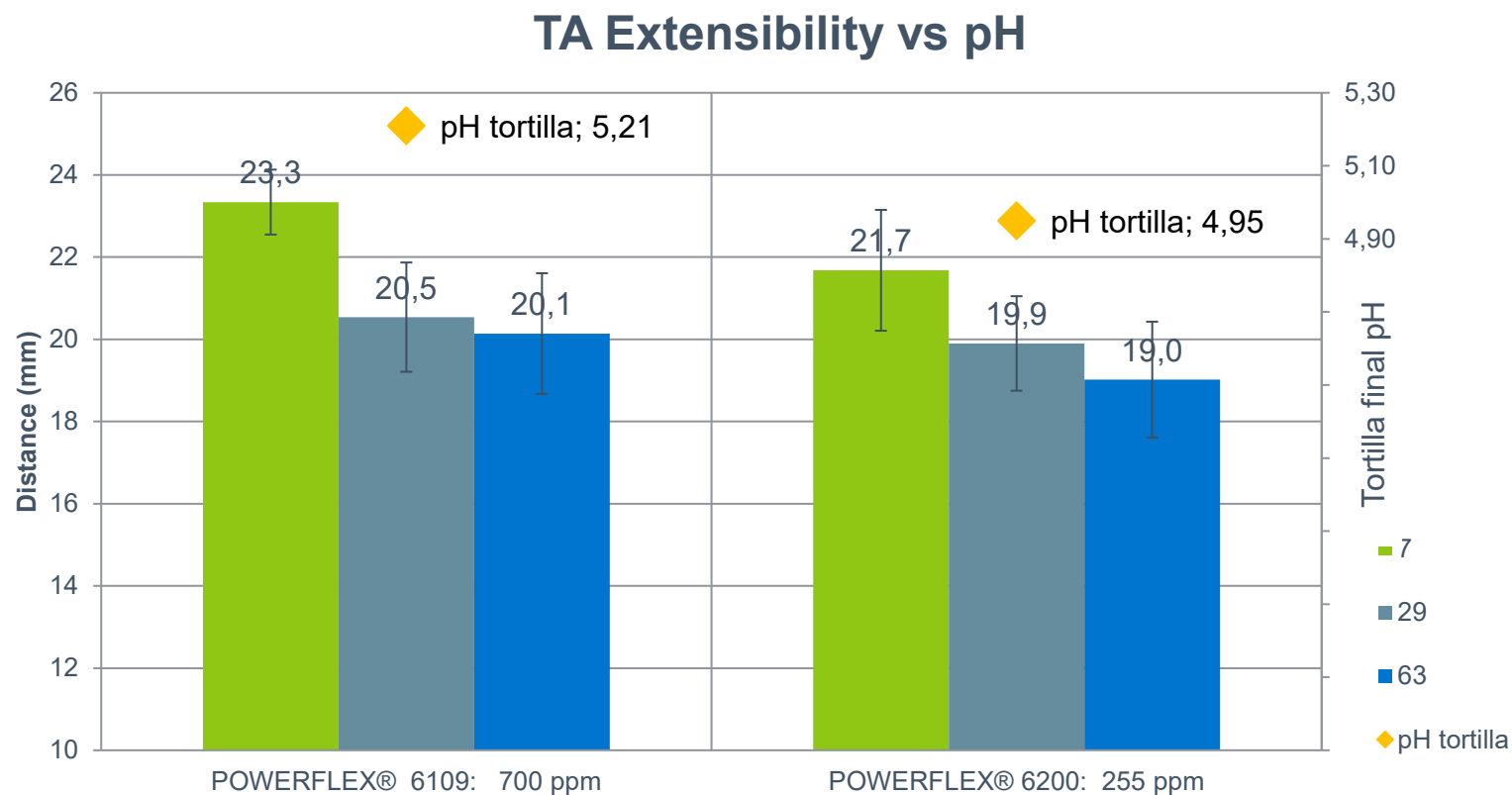
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AMYLASE PATTERN OF ACTIVITY

Schematics



POWERFLEX G4 AND EFFECT OF pH CORRECTION WITH COATED ACID



POWERFLEX® G4
technology tolerates
lower pH, 5.0

UNLOCKING VALUE WITH ENZYMES

02 | Tortilla Diameter Control





POWERFLEX® ENZYME RANGE STREAMLINES PROCESSING AND DELIVERS SUPERIOR TORTILLAS

**POWERFLEX®
Enzyme Range**



Improve dough
pressability and
processability



Minimize size
and shape
rejects



Provides outstanding
softness, moistness
and flexibility

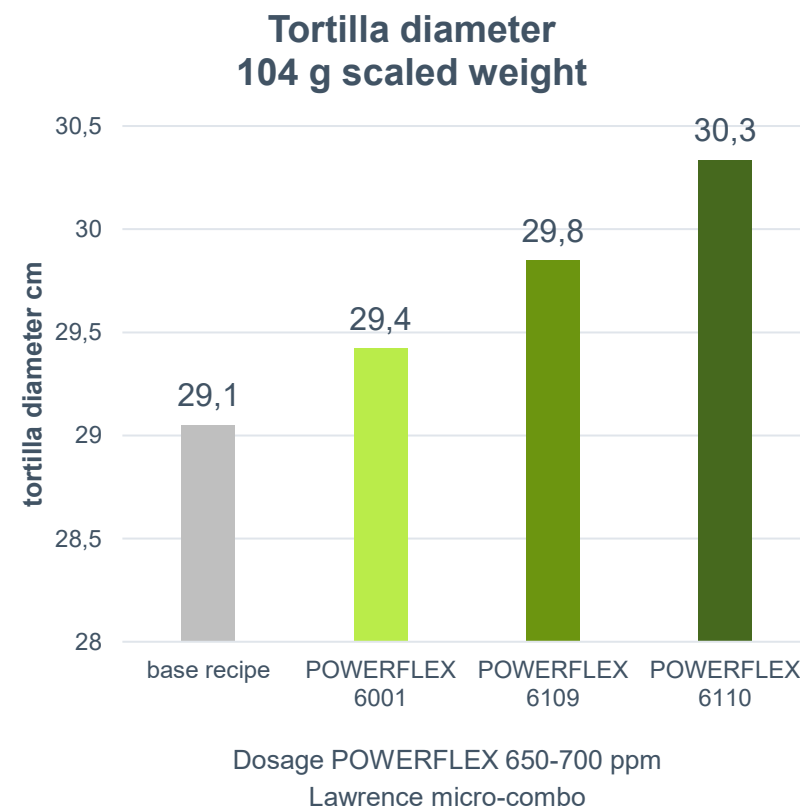


Maintains
shelf life for 6
to 9 months

POWERFLEX® RANGE AND TORTILLA SIZE

INCREASE DOUGH RELAXATION WITH
THE RIGHT TYPE OF POWERFLEX®

POWERFLEX® 6001	POWERFLEX® 6109	POWERFLEX® 6110
<ul style="list-style-type: none">✓ Improved flexibility and rollability✓ Improved freshness	<ul style="list-style-type: none">✓ Improved flexibility and rollability✓ Improved stay-fresh appearance✓ Easier pressing of dough	<ul style="list-style-type: none">✓ Improved flexibility and rollability✓ Improved stay-fresh appearance✓ Easier pressing for stronger flours and shorter rest times



UNLOCKING VALUE WITH ENZYMES

03 | Flour Quality Tolerance



UPGRADE FLOUR IN WHEAT TORTILLA

Folding at 30 days

Premium grade flour

Protein 11.5%
Wet gluten 27.3%
Alveo: W: 300
P/L : 0.4-0.7



Economy grade flour

Protein: 9%-8.7%
Wet gluten: 22.5%
Alveo: W: 110-150,
P/L : 0.4-0.7



Premium grade flour
POWERFLEX® 6109

Economy grade flour
POWERFLEX® 6001

POWERFLEX® enzyme technology helps improve the formulation for a more versatile use of flours without major compromises on tortilla quality.

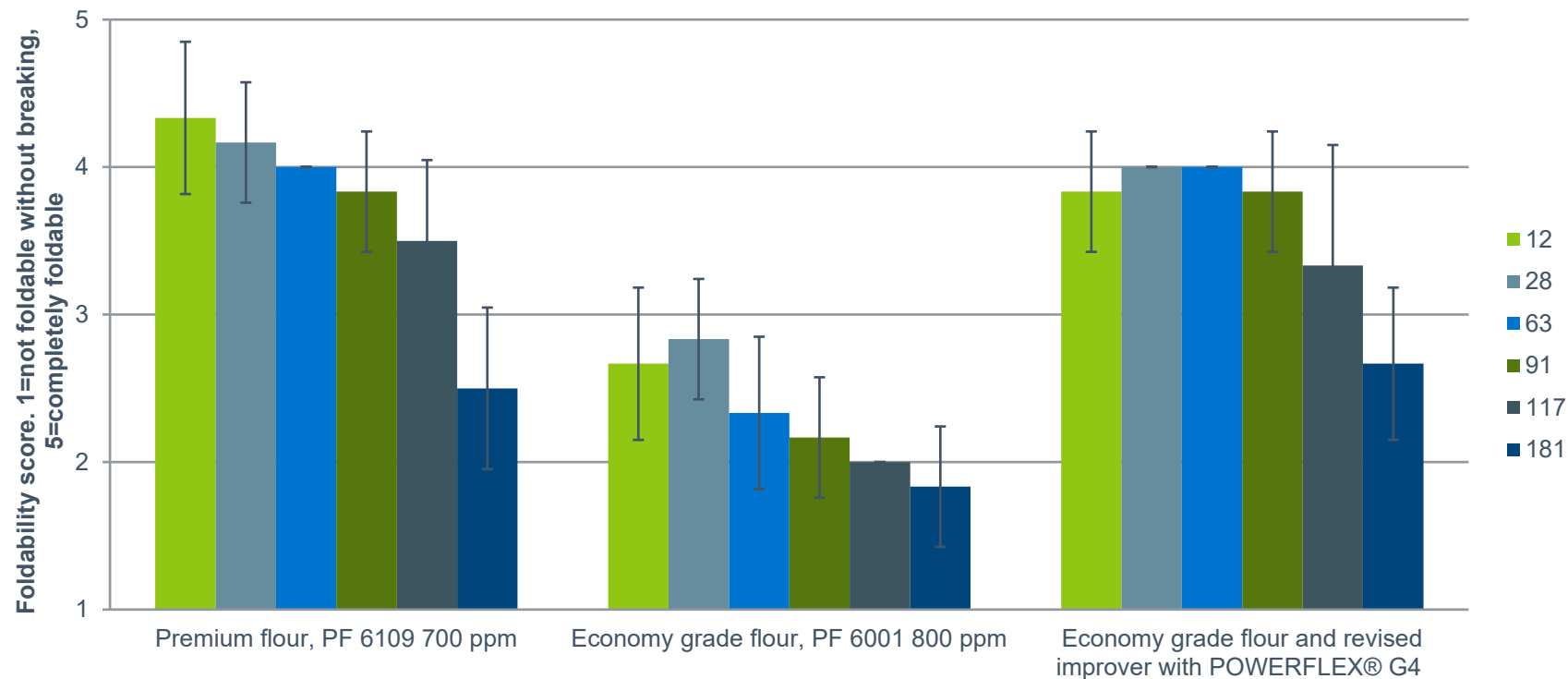


Economy grade flour
and revised formula
POWERFLEX® 6200

POWERFLEX® G4 IN ECONOMY GRADE FLOURS



Foldability during shelf life



POWERFLEX® G4
enables some formula
optimization, allowing
to maintain the tortilla
handling properties
for different flour
quality

Reference premium
grade flour



Drop in
performance

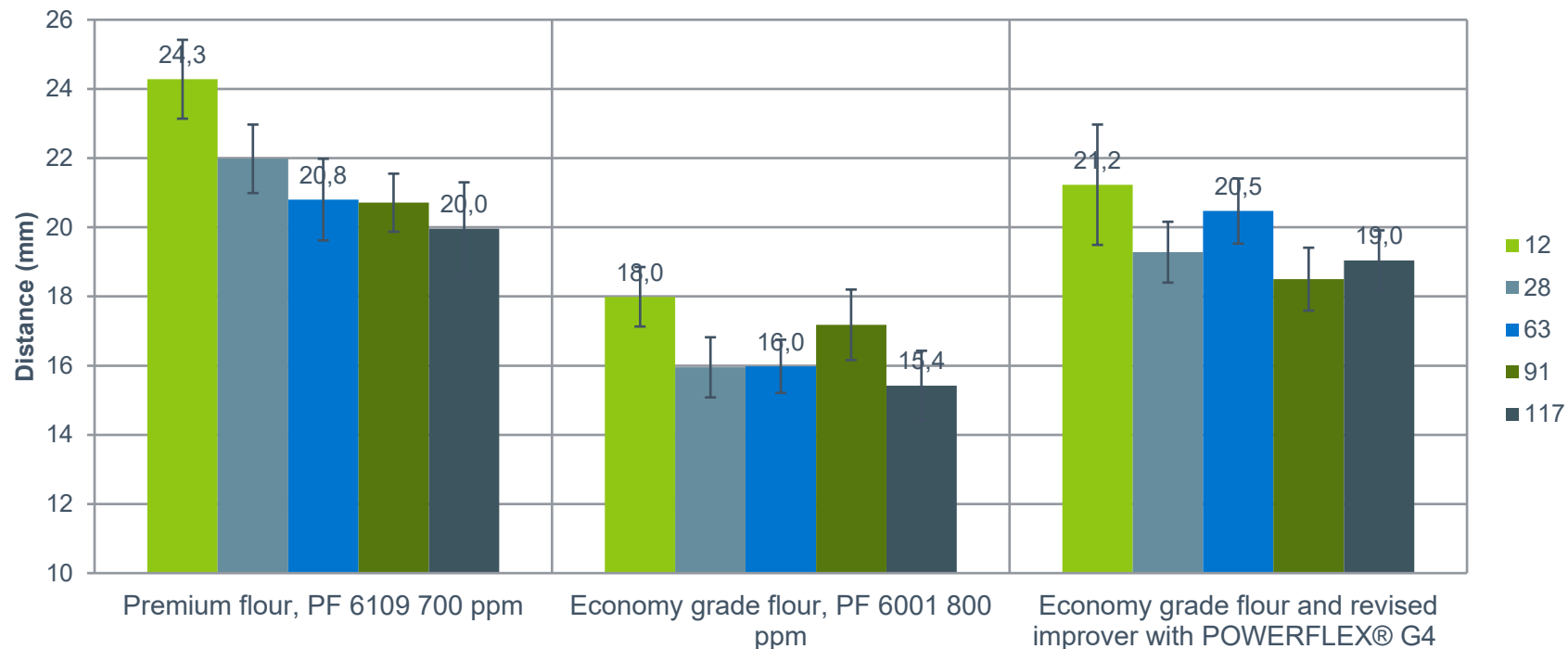


Good recover in
pliability

POWERFLEX® G4 IN ECONOMY GRADE FLOURS



Tortilla Extensibility during shelf life



Reference premium grade flour



Drop in extensibility



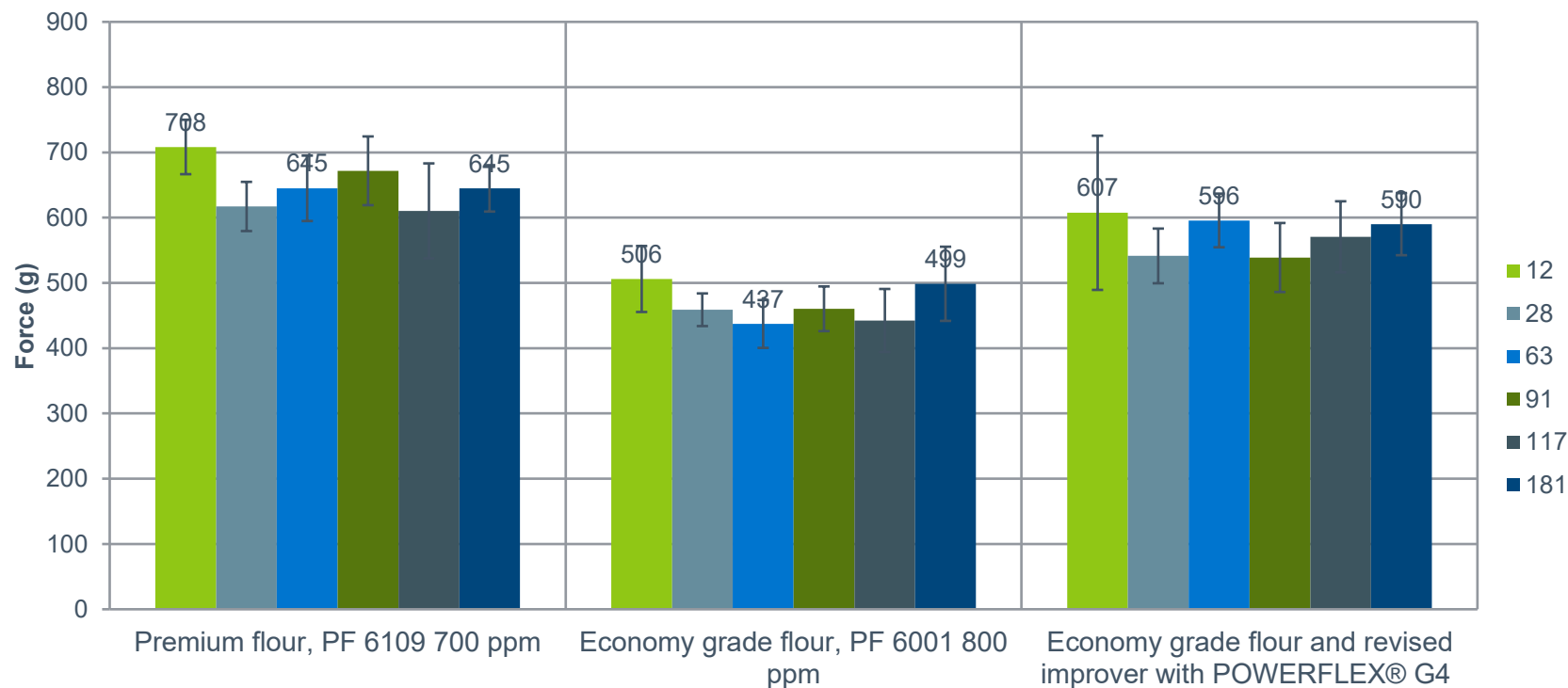
Important recovery in measured extensibility

POWERFLEX® G4
enables formula
optimization, allowing
to maintain the tortilla
textural properties in
different flour quality

POWERFLEX® G4 IN ECONOMY GRADE FLOURS



Tortilla Strength over shelf life



Reference premium grade flour



Weaker tortilla



Partial recovery in strength

Reformulation with **POWERFLEX® G4** helps maintaining the tortilla robustness in different flour quality

UNLOCKING VALUE WITH ENZYMES

04 | Challenging Flatbread Formulations
(Piadina, Whole Wheat & Beyond)



CHALLENGING FLATBREADS

Piadina



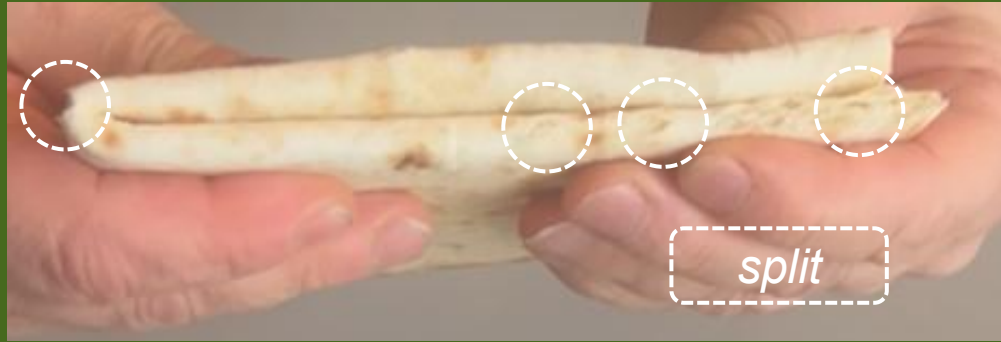
FLATBREAD - PIADINA

How piadina is consumed:

- Piadina is an Italian flatbread traditionally made with white flour, fat such as cured lard or olive oil and salt and water.
- The original product can be experienced in kiosks where these freshly prepared and served warm and lightly crispy with a variety of high quality fillings
- Compared to a tortilla, piadina is higher in fat, thicker 130 g and more difficult to fold without cracks
- Typically, it is manufactured by lamination but some producers can use hot press technology

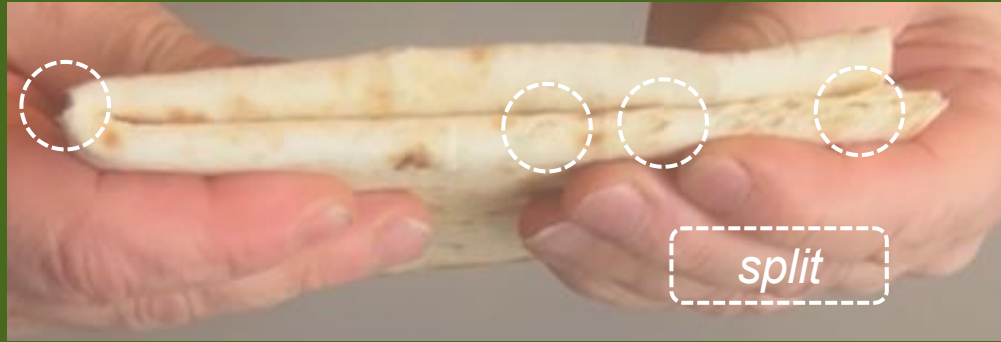


PIADINA: SIMPLE FOLDING AT 90 DAYS



Market reference improver (non-optimized)

PIADINA: SIMPLE FOLDING AT 90 DAYS



Market reference improver (non-optimized)



Piadina with POWERFLEX® 6200: 230ppm

REFORMULATE PIADINA WITH POWERFLEX® G4 TECHNOLOGY

STRESS FOLDING ALONG LINE AT 33 DAYS



Formulation with G4
with emulsifier



Formulation with G4
without emulsifier

POWERFlex® G4
delivers the required
foldability independently,
demonstrating its potential
to support emulsifier
reduction or replacement

FORMULATION WITHOUT MONOGLYCERIDE AT 90 DAYS LABEL FRIENDLY PIADINA WITH POWERFLEX® G4

Simple folding



Stress foldings





PIADINA SHELF-LIFE STUDY

FOLDING SCORES



Break less than 25%
score 4



Breaks between
25% and 50%
score 3

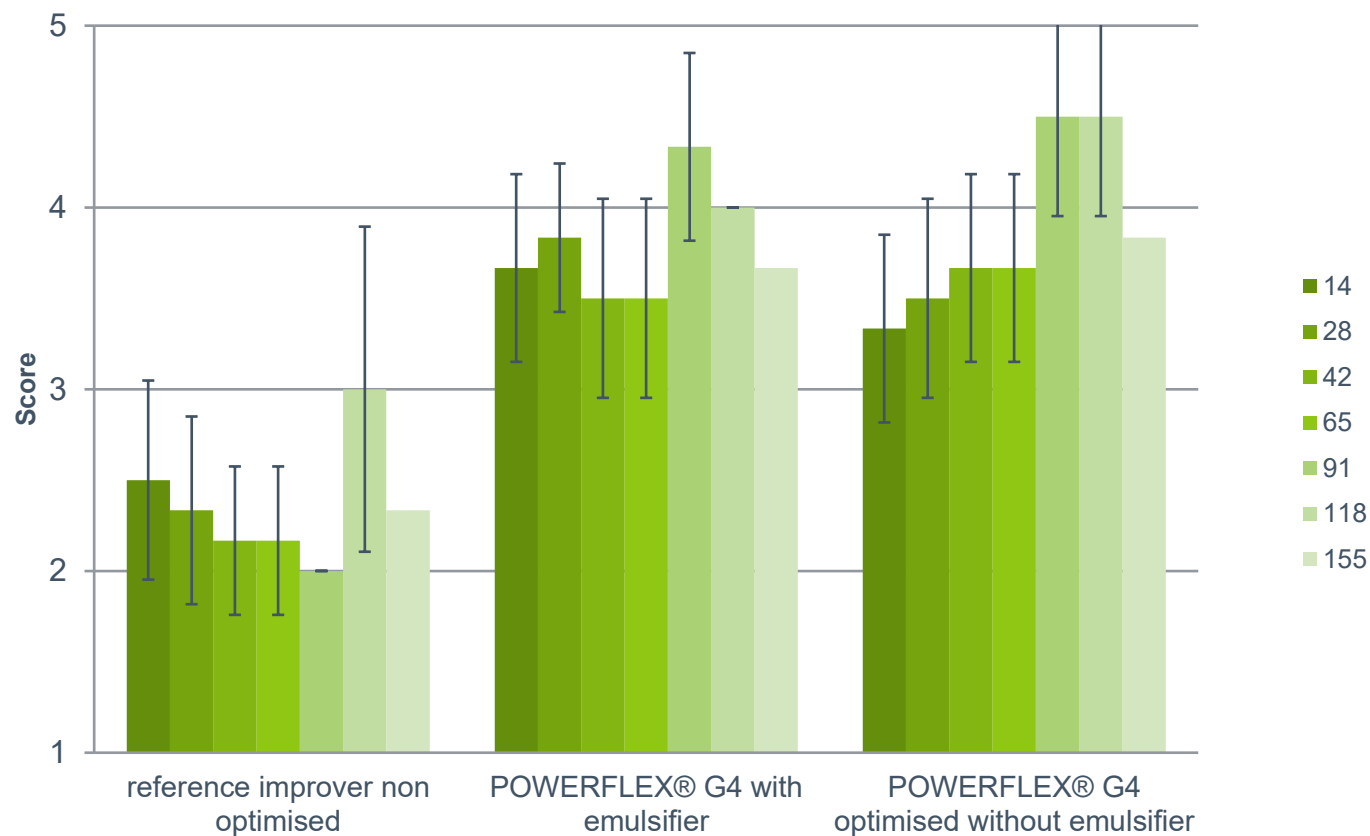


More than 50%
breaks **score 2**



Breaks completely
score 1

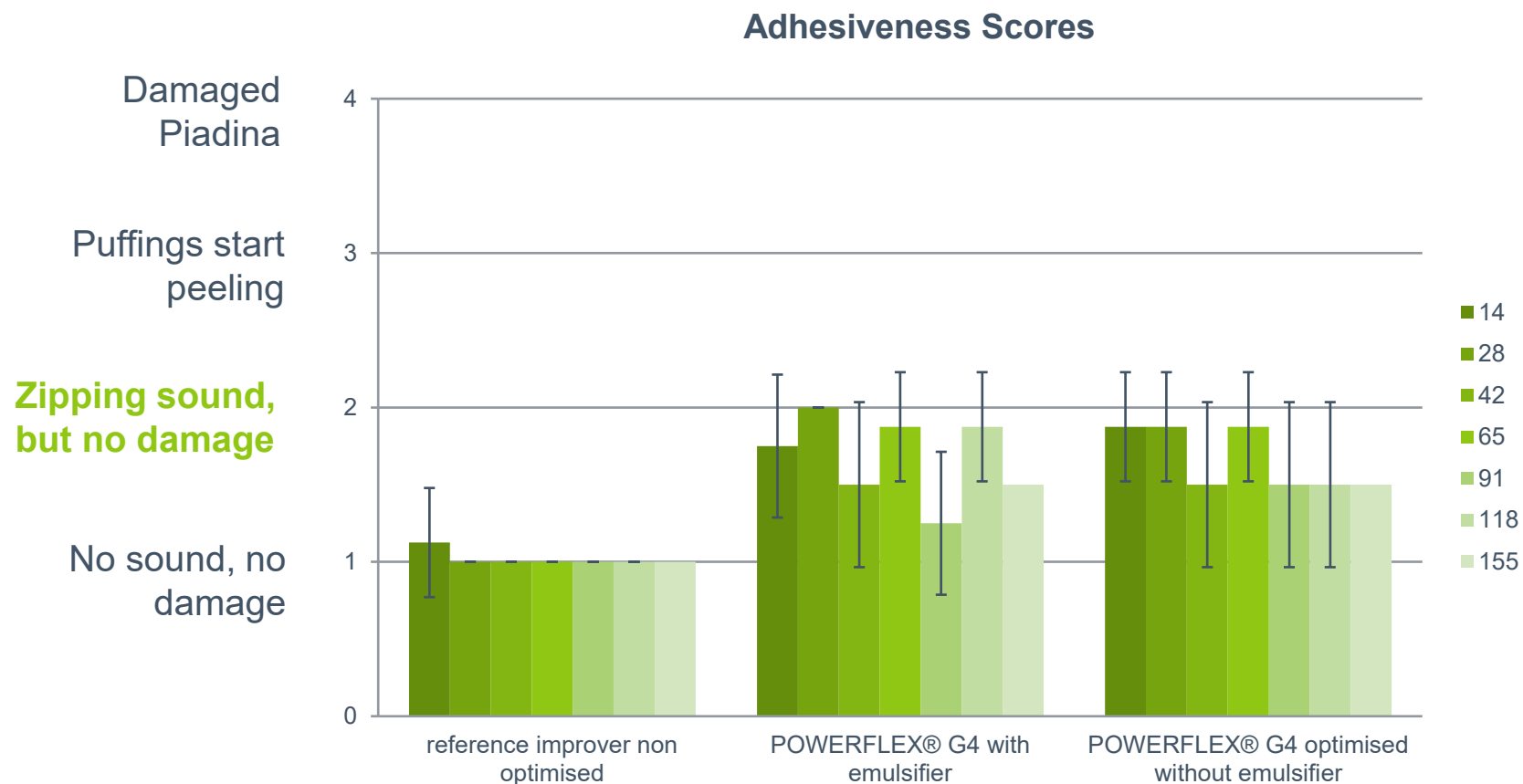
Foldability during shelf life





REFORMULATE PIADINA WITH POWERFLEX® G4 TECHNOLOGY

PIADINA ADHESION DAMAGE



✓

In this product case optimization with **POWERFLEX® G4** did not compromise the adhesion among tortilla with/without emulsifier

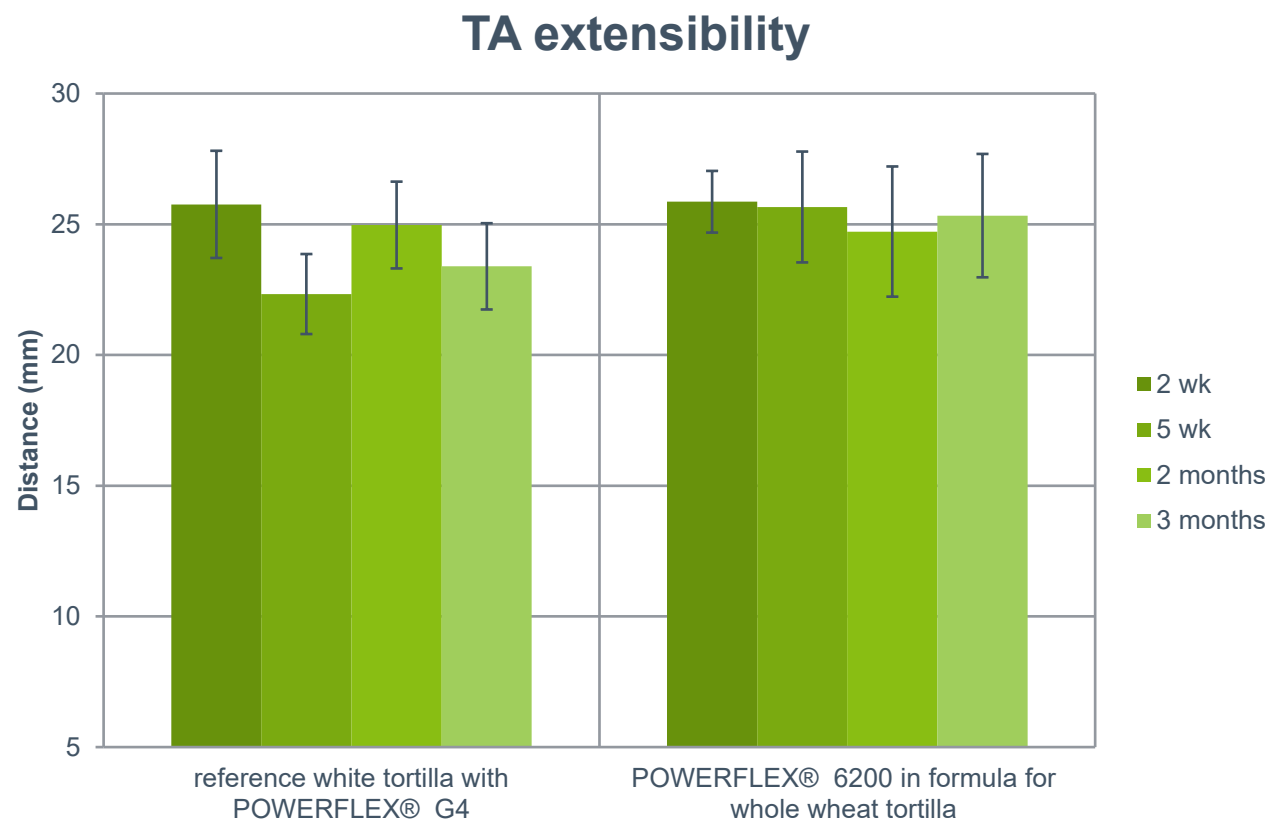
CHALLENGING FLATBREADS

Whole Wheat tortilla



WHOLE WHEAT TORTILLA

POWERFLEX® G4 TECHNOLOGY DELIVERS
WHITE-FLOUR FOLDABILITY IN WHOLE
WHEAT TORTILLAS



Folding at day 95



BENEFITS ACROSS TORTILLA & FLATBREAD APPLICATIONS

- ★ Different formulation challenges
- ★ Different enzyme options
- ✓ One adaptable G4 platform



IMPROVING FRESHNESS

Supports softness,
flexibility and foldability
throughout shelf life



DOUGH PROCESSABILITY

Helps adjust dough
relaxation and pressability
to meet size requirements



FLOUR QUALITY TOLERANCE

Supports consistent
tortilla properties when
flour quality varies



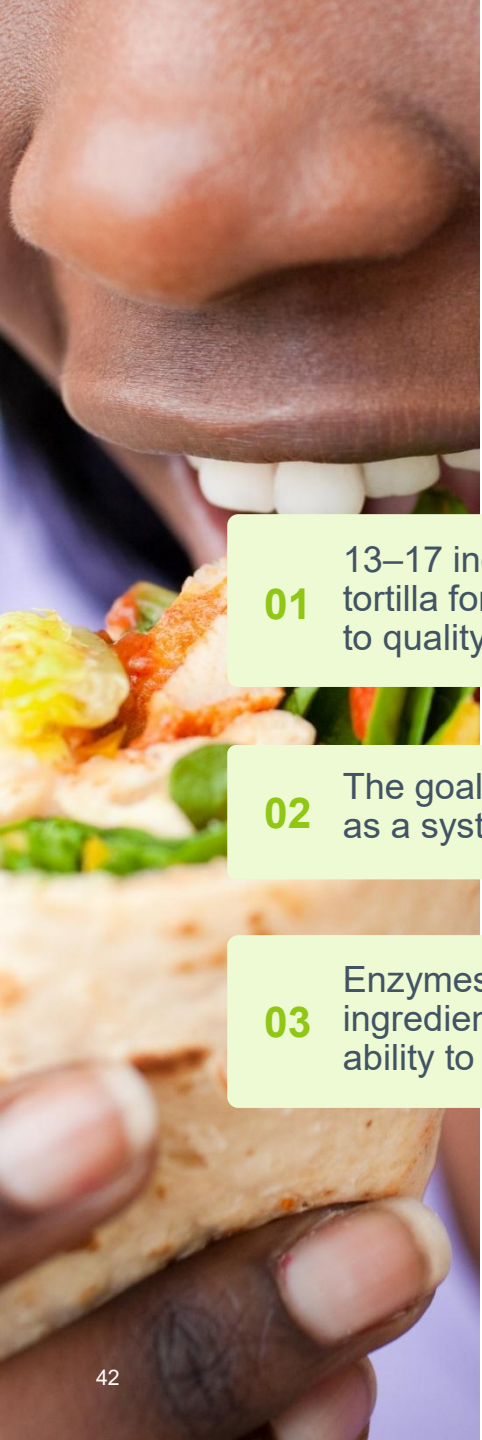
FORMULATION FLEXIBILITY

Provides formulation options
for challenging applications,
including piadina and whole-
wheat tortillas

HOW TO THINK ABOUT COST...

Understanding enzyme cost in relation
to other key ingredient additives





BALANCING PERFORMANCE, PROCESSING AND FORMULATION EFFICIENCY

Ingredient selection requires evaluating not only individual functionality, but also interactions within the complete tortilla system.

01 13–17 ingredients typically shape tortilla formulations, each contributing to quality and process performance

02 The goal is to optimize the formulation as a system—not individual ingredients

03 Enzymes should be evaluated for ingredient interactions and their ability to deliver multiple functions



Target Product Attributes

- Freshness and shelf life
- Foldability and flexibility
- Texture and bite
- Taste and appearance



Processing Performance

- Dough rheology
- Tolerance to process variation
- Sheetting and machinability
- Consistency across production runs



Formulation Efficiency

- Functional contribution of each ingredient
- Ingredient synergies and trade-offs
- Opportunities for simplification
- Cost-in-use of the complete system

HOW TO UNDERSTAND ENZYME COST IN RELATION TO COMMONLY USED INGREDIENTS

Cost is indexed to flour

	Typical Dosage % fb	CIU Index
Flour - high quality	100	100
Flour - low quality	100	92
Oil or shortening	6-8	11-15
Hydrocolloid	0.3-0.4	5- 6
Coated acid	0.9 - 1.1	10-12
Emulsifier	0.3 - 0.6	3 - 6
POWERFLEX® enzyme range	0.022 – 0.075	4 - 9



POWERFLEX® has a relatively low cost-in-use with a broad functional contribution, creating value beyond its share of formulation cost.



Beyond its direct cost-in-use and overall contribution, **POWERFLEX®** can create additional value when optimizing the use of emulsifiers, stabilizers and relaxants within the formulation.



SMALL DOSAGE. SIGNIFICANT IMPACT.

POWERFLEX® G4 contributes to tortilla quality, formulation flexibility and system-wide efficiency across a wide range of tortilla applications..

PROVEN G4-ENZYME TECHNOLOGY EXPERTISE

IFF pioneered G4 enzyme technology and continues to advance tortilla performance.

MORE FORMULATION OPTIONS

Improve freshness, flexibility and processability across different flours, formats and formulation needs.

VALUE BEYOND INGREDIENT COST

The right enzyme solution can support performance, formulation efficiency and cost-in-use across the complete system.

Measured in dosage, enzymes are small. Measured in impact, they are not.



THANK YOU

We look forward to your questions and to continue the conversation beyond today.

iff

A photograph of three people enjoying tacos outdoors. In the center, a woman with long dark hair and a nose ring smiles broadly while holding a taco. To her left, a man with a beard and a grey jacket is also eating a taco. To her right, a man is seen in profile, focused on eating his taco. They are all holding tacos in white paper wrappers. The background is a blurred green wall. A large green semi-circle is in the top-left corner, and a dark green semi-circle is in the bottom-right corner.

PIONEERS
of enzyme innovation.

EXPERTS
in tortilla freshness.

Powered by
POWERFLEX® G4 Technology

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