ENZYMES in TORTILLAS and FLAT BREADS

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IBIE 2016-October 11, 2016
Outline

Introduction to ENZYMES

Enzymes in FLOUR TORTILLAS

Enzymes in CORN TORTILLAS

Enzymes in FLAT BREADS

Q&A
Nature: Source of enzymes
Enzymes are natural

Active proteins

In all living organisms
• Plant
• Animal
• Microorganisms-fungal, bacterial

Specific
• Works under mild conditions
• Replaces/reduces chemicals
An example on benefits of fresh-keeping enzymes

A solution lets producers optimize their distribution, and offers consumers bread that’s soft, elastic and moist to the last slice.
How enzymes work
Important process parameters for enzymes

- pH
- Temperature
- Enzyme dosage
- Stabilizers
- Oxygen
- Water
- Substrate
- Inhibitors
- Contact time

**pH effect**

**Temperature effect**
Enzymes maintains tortilla freshness

Stale tortillas/flat breads are firm and they crack when folded, become unacceptable to consumers

Enzymes can;
• Extend shelf-life
• Improve dough handling and machinability
• Enhance mixing tolerance
• Replace/reduce chemicals
Enzymes in flour tortillas
Flour tortillas
Short baking time

1
Dries quickly

Flexibility maintenance is important

2
Shortenings, emulsifiers, vital gluten, dough relaxers are critical

• Consumers desire less ingredients
• Clean label is vital
Enzymes used in flour tortillas

**Enzymes**
- Alpha-amylase

**Fresh keeping**
Maintenance of softness, flexibility and moistness of tortillas up to six months

**Ingredient reduction**
**Ingredient replacement**
- L-cysteine/SMS
- Gums
- Emulsifiers
- Vital gluten
Flour tortillas

SIX WEEK-storage

With enzymes:
Flexible, no cracking

Without enzymes:
Undesirable cracks

Novozymes internal data
Novozymes new Alpha-amylose maintains the flexibility over FIVE MONTHS

No enzyme

New Alpha-amylose

Novozymes internal data
SIX WEEK-storage (industrial production)
--Performance increases with dosage increase of the new Alpha-amylase

Rollability test:
1.0 cm diameter-dowel
1=breaks easily
5=no cracking

Sensorial Softness
1=very hard
5=very soft

Sensorial Flexibility:
1=very brittle
5=very flexible
The new Alpha-amylase (industrial production)
--Stronger & more extensible tortillas increases over time
Ingredient replacement by New Alpha-amylase

Gums/hydrocolloids
0.1-1.0% on flour weight usage
→ Guar gum is a commonly used hydrocolloid

Emulsifiers
0.5-1.0% on flour weight usage
→ Mono- and di-glycerides is a commonly used emulsifier
The new Alpha-amylase makes strong and extensible tortillas WITHOUT Guar gum and Mono- and di-glycerides (industrial production)

Instrumental tortilla strength (breaking force). Using a Texture Analyzer (TA.XT2-Tortilla Burst Rig; TA-108a 7/16" diameter acrylic cylinder probe to puncture the tortillas), breaking force was defined as the force to rupture the tortillas.
The new Alpha-amylase makes soft, flexible, strong, and moist tortillas WITHOUT guar gum and Mono- and di-glycerides (industrial production)

![Graph showing sensory scores](image)

Total sensory scores were defined as the sum of sensorial scores for flexibility, softness, moistness, and strength. Sensory evaluation conducted by a panel of 10 people. 1 to 5 scale; 1 being the worst; 5 being the best.
Enzymes in corn tortillas
### Corn tortillas

**Short baking time**

- **Stale faster than flour tortillas**
- **Maintenance of flexibility is important**

- **Gums are critical**
- **Consumers desire STRONG and FLEXIBLE tortillas**

<table>
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<tr>
<th>Enzymes</th>
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<tr>
<td>- Alpha-amylase</td>
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<td>- Lipase</td>
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<th>Fresh keeping</th>
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<tr>
<td>- Maintenance of softness and flexibility</td>
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<tr>
<td>- Reduction of masa stickiness</td>
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<td>- Processing ease</td>
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Corn tortillas

Ten day-old tortillas

With enzymes:
Flexible, no cracking

Without enzymes:
Undesirable cracks
Two-week old corn tortillas

Alpha-amylase improves corn tortilla strength during storage

Masa dough

Less sticky and softer corn masa obtained with an Alpha-amylase and a Lipase

Sticky dough

Non-sticky dough

Hard dough

Soft dough

Novozymes internal data - Equipment: TA.XT2
Enzymes in flat breads
Flat breads
Difficult to retain softness even for one day

1. Quickly becomes stale and chewy
   - No technology offers longer freshness

2. Reheating of frozen flat bread results in a very dry and elastic bread
   - Maintenance of softness is important
   - Enzymes can help to retain the softness
Enzymes used in flat breads

Enzymes

• Alpha-amylase
• Lipase

Fresh keeping

Maintenance of softness and flexibility
Alpha-amylase maintains and improves flat bread softness for three days.

![Image of flat bread](image)

Graph showing the softness of flat bread with different concentrations of alpha-amylase over three days. The graph indicates that 10 ppm of alpha-amylase maintains and improves flat bread softness better than 5 ppm or no enzyme. Novozymes internal data.
A Lipase makes softer Naan dough and softer Naan

Novozymes internal data
Frozen Naan

A lipase gives 22% more mechanical and sensorial softness compared to those without enzymes after 40 days of storage under frozen condition at -20 °C.

Novozymes internal data
Chapatti with a lipase
--excellent dough property and better softness

Novozymes internal data

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Graph showing the comparison of firmness and softness between no enzymes and 250 ppm lipase over 30 min and 3 hrs after baking.
Enzymes are natural

Enzymes

Maintain freshly baked quality of tortillas/flat breads

- Improve dough handling and machinability
- Enhance mixing tolerance
- Replace/reduce chemicals
Chapter 10 - Enzymes: Extending shelf life and eating quality of tortillas
Dilek Lemlioglu-Austin

Summary
- Industrial Enzymes used in baking operation
- Enzymes used in Tortillas
- Enzymes in Wheat Flour Tortillas
- Enzymes used in Corn Tortillas

A good source for enzymes and tortillas

Thank you
Increasing Potassium: The New Sodium Reduction Strategy in Chemically Leavened Goods

Dinnie Jordan – CEO
11th October 2016
Contents

1. Why we need potassium
2. Balancing sodium and potassium
3. Introducing potassium in baked goods while delivering sodium reduction
4. Take home message
Potassium: An Essential Mineral

- Maintains body fluid levels
- Synergistic relationship with sodium
- Helps to excrete excess sodium
- Maintains healthy bones
- Activates nerve impulses
Recommended Potassium Levels

Average potassium consumption in the US is: \(~2547\text{mg/day}\)

More than 98% of US adults are deficient in potassium

2015-2020 dietary guidelines: \(4700\text{mg/day}\)

\(= 4700\text{mg}\)
Deficiency in Potassium Leads to...

- Fatigue and muscle weakness
- Inactive reflexes
  - Anemia
  - Headaches
- Swollen glands
- Diabetes


'..increase potassium intake from food to reduce blood pressure and the risk of cardiovascular disease, stroke and coronary heart disease in adults.'
Potassium – ‘Nutrition Fact Labels’:

‘Potassium is a nutrient Americans don’t always get enough of, according to the nationwide food consumption surveys... a potassium deficiency increases the risk factors for artery, kidney and heart disease’

‘under consumption was evident across the population, ...particular concern for middle-aged and older adults, who are at increased risk for cardiovascular diseases..’

‘critical for health, as deficiency...affects numerous organ systems including the musculoskeletal, renal, and cardiovascular systems.’
How Can the Baking Industry Assist Consumer’s Dietary Needs?
Bring Sodium and Potassium into Balance

Average US sodium intake: 3400mg/day
Advised to decrease to: 2300mg/day
Total decrease of 1100mg/day
32% decrease

Average US potassium intake: 2790mg/day
Advised to increase to: 4700mg/day
Total increase of 1910mg/day
68% increase

kudos blends the chemistry behind baking
Sources of Sodium in Bakery Products

- Sodium chloride (salt) 49% sodium
- Sodium bicarbonate 27% sodium
- Sodium phosphate (SAPP) 21% sodium
Potassium Alternatives

- Potassium chloride
- Potassium bicarbonate

There is no potassium alternative for SAPP
Potassium Chloride

- Less effective preservative than sodium chloride
- Not so effective at controlling yeast fermentation
- Not so functional in bread products
- Large particles slow to dissolve
- Too much causes taste issues

KCl

Smart Salt®
SaltWise
Nu tek Salt
4 salt®
sub reduced

kudos blends the chemistry behind baking
Potassium Bicarbonate

Like sodium bicarbonate, it's just a carrier of CO₂

Provides less CO₂ compared to sodium bicarbonate (on a weight basis)

Traditionally very coarse

Large particles don’t fully dissolve

Control reactivity with acidulants - they stay the same

KHCO₃
Traditional Potassium Bicarbonate

- Unsightly spotting caused by coarse particles
- Localised areas of high pH
- Poor volume and colour
- Metallic taste

KUDOS™ Potassium Bicarbonate

- Full dissolution even in dough products
- Even crumb pH
- Excellent volume and colour
- No noticeable metallic taste
Salt System

~50/50 NaCl/KCl mixture

Leavening System

100% potassium bicarbonate + SAPP

Bring Sodium and Potassium into Balance
Balancing Sodium and Potassium in Practice
How to Reduce Sodium?

**PER 100g:**
- Sodium = 749mg
- Potassium = zero

**ACHIEVES:**
- 29.6% reduction in sodium

**Salt @1.125%**
- Sodium bicarbonate @0.55%
- Sodium acid pyrophosphate @ 0.75%

**Salt @0.5625%**
- Sodium bicarbonate @0.55%
- Sodium acid pyrophosphate @ 0.75%

**PER 100g:**
- Sodium = 528mg
- Potassium = zero

**ACHIEVES:**
- 29.6% reduction in sodium

*Salt & the chemistry behind baking*
Further Sodium Reduction AND Delivery of Potassium

PER 100g:
Sodium = 749mg
Potassium = zero

ACHIEVES:
49.7% reduction in sodium
5.5% RDA of potassium

Salt @1.125%
Sodium bicarbonate @0.55%
Sodium acid pyrophosphate @ 0.75%

Salt @0.5625%
Potassium bicarbonate @0.65%
Sodium acid pyrophosphate @ 0.75%
Further Reduce Sodium and MASSIVELY Increase Potassium

PER 100g:
Salt @1.125%
Sodium bicarbonate @0.55%
Sodium acid pyrophosphate @ 0.75%

Sodium = 749mg
Potassium = zero

PER 100g:
Salt @0.5625%
Potassium bicarbonate @0.65%
Potassium chloride @0.5625%
Sodium acid pyrophosphate @ 0.75%

Sodium = 377mg
Potassium = 558mg

ACHIEVES:
49.7% reduction in sodium
11.9% RDA of potassium

kudos blends
the chemistry behind baking
Why Should we Introduce Potassium to Baked Products?

• Potassium is essential for maintaining cardiovascular health, as well as renal health and enables functioning of the central nervous system.

• Using KUDOS™ Potassium Bicarbonate can contribute up to the US target potassium level (4700mg).

• Potassium based ingredient solutions bring sodium and potassium into balance.

• KUDOS™ Potassium Bicarbonate is tailor made for chemically leavened goods.
Take Home Message

Don’t contribute to the national health problems with sodium based ingredients.

Do contribute to the national health solution with potassium alternatives.

It is our responsibility to ensure the products we manufacture are as healthy as possible for consumers and do not negatively impact their health.

We have the power to make a real positive difference to the health of everyone.

Prevention is better than cure.

So what are you waiting for?
Please visit us at booth 819, hall N 1-4

Our experts in raising agent technology and low sodium solutions will be on hand to answer any questions you may have.
“The leading supplier of technically driven raising agents”

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