Enzymes in Wheat Flour Tortilla

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All about Tortillas

All over the world, consumers are enjoying tortillas!

As staple bakery product in many countries, the market for tortillas is expanding and growing all the time.
Trends in Wheat Flour Tortilla

A diverse sector developing interesting products

- Ancient grains: to offer an alternative to wheat and to provide texture, flavour and a range of nutritional benefits that are appealing to a global audience.

- Functional health is an area which is beginning to grow in Bakery: added fiber is the most successful among consumers.

- Flavour: a key trend throughout bakery

- New formats: differentiation and miniatures (mini tortillas boats)

Source: Mintel GNPD
Wheat Flour Tortilla Quality

- A soft and silky texture
- Excellent rollability
- Resistance to cracking
- High degree of opacity (no translucency)
- Appearance: uniform, round shape, toast points, small, evenly distributed blisters

- Excellent fluffiness (layered structure)
- Optimal shelf life (no moulding)
- Good ease of separation (no stickiness and zippering)
Tortilla Quality - Regional Preferences

Mexico
- Larger diameters
- Thin tortillas
- Translucent
- High fat content (up to 25%)
- Less fluffy/layered

Europe and USA
- Smaller diameters
- Thicker tortillas
- Opaque
- Lower fat content (8-9%)
- More fluffy/layered
Basic Industrialized Wheat Flour Tortilla Formula.

Batch pack composition:
- Baking Powder: 18%
- Emulsifiers: 21%
- Salt: 14%
- Gluten: 14%
- Preservatives: 7%
- Acidulants: 3%
- Sweeteners: 14%
- Gums: 7%
- Enzymes: 2%
Wheat Flour Tortilla Ingredients: Wheat flour

Wheat Flour components and functionality

- Starch 65 – 70 % Water binding, texture, yeast, substrate, colour
- Gluten proteins 7 – 16 % Gluten network, gas holding properties, extensibility
- Arabinoxylans 1 - 3 % Water binding, gel formation
- Lipids 0.8 – 1.5 % Gluten elasticity, gas cell stability
- Moisture 12 – 16 %
Wheat flour in tortilla processing: Proteins

- Wheat flour is used for many products (bread, cake, tortilla, pasta, noodles,...).
- Properties of flour components, specially gluten, determine its functionality - end use.
- Tortilla Flour: influence on tortilla quality and shelf stability
Wheat flour in tortilla processing: Proteins

Protein content/quality

- Enough gluten strength to keep the dough together, shrink-proof when flattened and baked.
- Good flexibility: Good foldability and rollability of tortillas that do not break while folding/rolling.

<table>
<thead>
<tr>
<th>Manufacture process</th>
<th>Protein content</th>
<th>Flour treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot press</td>
<td>9.5 - 11.5 %</td>
<td>Reducing agents/proteases</td>
</tr>
<tr>
<td>Die-cut</td>
<td>11.5-14%</td>
<td>Oxidants</td>
</tr>
<tr>
<td>Hand-strech</td>
<td>10.0-11.5%</td>
<td></td>
</tr>
</tbody>
</table>
Wheat flour in tortilla processing: Proteins

Relationship flour protein with tortilla quality

- Tortilla strength/toughness and extensibility can be evaluated using a texture analyzer.
- Extensibility gives an indication for foldability

![Texture Analyzer Image]

![Graph showing Force vs Time]
Wheat flour in tortilla processing: Proteins

Relationship flour protein with tortilla quality

Protein content \(\rightarrow\) predictor of tortilla quality.

- Low protein content (< 9%):
  - gives tortillas that crack easily,
  - larger diameters
- Protein contents > 12%
  - better foldability
  - but too long mixing and resting times
  - smaller diameters
Starch is a reserve polysaccharide with granular structure: round and lenticular shape, sizes of 2-10 and 20-35 μm.

Composition: the two major components of regular starch are:

- Amylose (15–25%) and
- Amylopectin

Amylose is an amorphous linear glucose polymer

Amylopectin is a semi-crystalline branched glucose polymer
Wheat flour in tortilla processing: Starch

Changes occurring in the starch during baking affect their functionality:

- Baking: hydrothermal treatment because of the presence of water and heat during baking.
- Starch absorbs water and swells and loses its crystalline structure during baking. This process is called Gelatinization and influences product texture. Limited gelatinization depends on amount of water and temperature and duration.
- Gelatinized starch is accessible to enzymes.

- Swelling
- (limited) Amylose leaching from the granule, granule remnants: swollen and enriched in amylopectin
- Loss of crystallinity
- Viscosity increase
Wheat Flour - Starch

Changes occurring in the starch during baking affect their functionality:

- After gelatinization starch tends to regain crystalline structure: Retrogradation
- Negative effect on shelf life (staling): Fresh tortillas have good foldability but during storage, tortillas get harder and loss foldability.
  - Amylose retrogradates fast after baking (≈ 30-60 min)
  - Amylopectin retrogradation starts one day after baking
- Damaged starch: starch granules can be damaged during milling. They have a very high water absorption that can lead to stickiness and quality problems.
Enzymes
What Can Enzymes Do In Tortilla Baking?

- Shape
- Fresh keeping
- Non Stick
- Rollability

- Fluffiness
- Cracking Edges

Dough conditioning
Tortilla quality
Tortilla shelf life
## Enzymes in Tortilla Making: what do we need?

There are several reactions for which we can use enzymes:

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Enzyme type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modification of (gelatinized) starch to delay/prevent crystallization</td>
<td>Amylases</td>
</tr>
<tr>
<td>Modification of (gluten) proteins in order to prevent formation of a</td>
<td>Proteases</td>
</tr>
<tr>
<td>strong gluten network which would reduce the size and increase the</td>
<td></td>
</tr>
<tr>
<td>shrinkage after pressing</td>
<td></td>
</tr>
<tr>
<td>Modification of gluten proteins to improve gluten strength</td>
<td>Oxidases</td>
</tr>
<tr>
<td>Modification of fat to generate emulsifier like structures which</td>
<td>Phospholipases/Lipases</td>
</tr>
<tr>
<td>are necessary for gas cell stability</td>
<td></td>
</tr>
<tr>
<td>Water management: generation of structures that bind more water and/or</td>
<td>Xylanases</td>
</tr>
<tr>
<td>breakdown structures to generate free water</td>
<td></td>
</tr>
</tbody>
</table>
Enzymes in Tortilla - Amylases

Amylases - Starch modifying enzymes

- Changes in starch during baking and storage affect product texture: Starch is (partly) gelatinized in tortillas. Limited gelatinization (and retrogradation) leads to better softening and shelf life.
- Texture properties can be affected by modifying starch structure: A limited starch breakdown is needed to give the tortillas the required strength and eating properties (bite, chewiness).
- Amylases can act on damaged starch and on gelatinized starch. Their action pattern on amylopectin is impacted by its branched structure.
- Fungal $\alpha$-amylases, bacterial $\alpha$-amylases, maltogenic amylases.
Anti-Staling Enzymes – Amylase Mechanism

**Amylopectin (starch)**

- Thermostable Bacterial Amylase
- Maltogenic Amylase
- G4/G+ Amylase

**Enzyme Properties**

- **Thermostable Bacterial Amylase**
  - Soft but gummy
  - Non-elastic bread crumb
  - Easily over-dosed

- **Maltogenic Amylase**
  - Soft, elastic bread crumb
  - Overdoing it is no problem

- **G4/G+ Amylase**
  - Soft, moist crumb
  - Slightly less elasticity
  - Can be over-dosed
Enzymes in Tortilla - Amylases

Effects of amylases on tortilla quality

- Effect of amylases on foldability, rollability – Hand measurement
- Effect of amylases on foldability, rollability – Instrumental measurement

![Graph showing toughness and extensibility over time](image)

- Toughness
- Extensibility
**Enzymes in Tortilla - Amylases**

**Effects of amylases on tortilla quality**

- Amylases improve the **foldability** of wheat flour tortillas
- Effect of amylases depends on its source, stability and dosage.

![Graph showing the effects of amylases on tortilla extensibility](image-url)
Softener Tortilla Solutions – features & benefits

The use of enzymes in tortilla’s is key to improve the processing attributes and the shelf life of the tortilla’s.

**Tortilla Softener**
- Shelf life extension
- Better fold and rollability
- Less cracking
- Softer and moister eating

**Premium Tortilla Softener**
- Long shelf life extension
- Better fold and rollability
- Less cracking
- Softer and moister eating

![Graph showing extensibility comparison between control and tortilla softener](image)
Enzymes in Tortilla – Gluten modifying enzymes

Gluten modifying enzymes: Proteases and Oxidases

- Gluten network affects dough properties (extensibility, elasticity, gas retention)
- Gluten influences shelf stability and flexibility of the tortilla
- Medium gluten strength is required for tortilla making:
  - Strong flour, very elastic gluten network → dough shrinkage and irregular shaped tortillas.
  - **Proteases**
  - Weak flour, low quality gluten → lower flexibility and rollability of the tortilla

Oxidases

A balance between a weak gluten during processing and a strong gluten in the final product.
Enzymes in Tortilla - Proteases

Tortilla Dough Conditioners

- For strong flours
- Reduces mixing time
- Improved dough handling
- Better extensibility
- Consistent shape
- Cysteine replacer
- Control of tortilla diameter

![Graph showing Diameter tortilla](attachment://image.png)
Enzymes in Tortilla - Proteases

Tortilla Dough Conditioners

- Delivers doughs with better extensibility & machinability
- Label-friendly solution without L-cysteine
- Control of tortilla diameter
Effects of Proteases enzymes on tortillas

Enzymes in Tortilla - Oxidase

Tortilla Dough Strengthening

- Low flour quality improver.
- Better dough stability
- Improved dough handling
- Good foldability
- Good eating characteristics
Enzymes in Tortilla - Oxidase

Tortilla Dough Strengthening

- Upgrades low quality flour - Delivers doughs with better dough stability & machinability
- Control of tortilla diameter
Enzymes in Tortilla - Oxidases

Tortilla Dough Strengthening

- Increase tortilla toughness
- No negative effects on foldability/extensibility of the tortilla
The use of enzymes in tortilla’s is key to improve the processing attributes and the shelf life of the tortilla’s.

**Tortilla Dough Conditioner**
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**Tortilla Dough Strengthening**
- Improved dough handling
- Good foldability
- Good eating characteristics
- Low flour quality improver.
- Improves anti stickiness
Tortilla Solutions Range – features & benefits

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The use of enzymes in tortilla’s is key to improve the processing attributes and the shelf life of the tortilla’s.
Supremo range US

AB Mauri puts flexibility and simplicity back into the hands of the manufacturer

Designed so you can produce a variety of tortillas, the AB Mauri Supremo™ Tortilla System is a series of high-performance leavening, softening, conditioning, preservation and relaxation modules. You dial up or dial down for thickness, softness, shelf life and stretch that will satisfy your customers every time.
Thank you for your attention!

Muchas gracias!

Moltes gràcies!