

*“ Tortillas that are Freeze-Thaw stable and
won’t stick ”*

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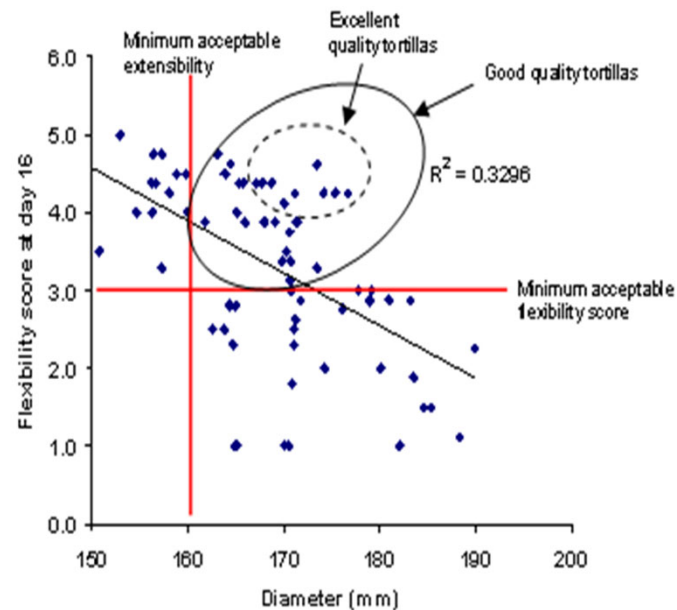
Introduction

- Tortillas are currently the most widely accepted type of bread product in the USA.
- Sales already exceeded \$9.5 Billion in 2014 (www.companiesandmarkets.com)
- Refined wheat products are popular due to appealing sensory attributes.
- Market trends / consumer demand are asking for less use of chemical additives and synthetic ingredients.
- Increasing consumer health concerns ask for 'cleaner label' food options.
- Globalized trade opportunities allow manufacturers to sell frozen/fresh type products into different continents – let alone countries... (e.g. US manufactured tortillas selling in Ireland)

Good Quality Tortillas

Tortillas must meet consumer expectations.

- Physical parameters (Soft, pliable).
- Good diameter, uniform, toast marks and longer shelf life periods.
- Non-Sticking (this problem can really affect repeat sales !)



Consumer's perspective:

GOOD QUALITY TORTILLAS are flexible, don't crack or tear, taste good and **DON'T STICK**.

(Waniska et al 2004, Jondiko et al 2016).

What Causes Sticking

CONSUMER EXPECTATIONS DRIVE THE SALE of YOUR PRODUCTS ...
Hence, manufacturers must prevent 'stickiness' in tortillas.

- ✓ Under mixing of dough.
 - Operator forgot to add enough water
 - New crop (year) flour may require more water for gluten development
- ✓ Over mixing of dough.
 - Gluten is denatured and cannot hold water
 - Too much heat generated during mixing makes dough weak.
- ✓ Improve freeze-thaw protocol.
 - Uncontrolled temperature changes cause water migration
 - Overdosing or lack of adequate ingredient quantities to hold water during freeze-thaw process will contribute to stickiness.

Industry tested solutions

Gums

- High molecular weight compounds which contribute to cohesiveness
- Some act as dietary fiber which the body has no ability to digest.
- Act as water-binders, texturizers, and adhesives
- Water solubility of the gums is key to functionality in tortillas.
- Gums dissolved in water increase dough viscosity and elasticity.



Emulsifiers

- ✓ Create a stronger gluten structure by increasing binding sites
- ✓ Contribute to stability of lipid-water systems
- ✓ Form a complex with gluten thereby improving dough machinability
- ✓ Contribute to the 'soft' texture of flour tortillas
- ✓ Contribute to the obtention of uniformly shaped tortillas
- ✓ Help decrease 'rubberiness' and sticking of tortilla products

The best starch-complexing ingredient is a Distilled Mono and Diglycerides – well proven by the industry today.



Overall objective

Evaluate the functionality of gums and emulsifiers in freeze-thaw cycles and prevent 'stickiness' in tortillas

Specific objectives

- ✓ Explain the use of gums and Emulsifiers as functional ingredients in tortillas and flat breads.
- ✓ Understand the effectiveness of selected gums and emulsifiers in tortillas

Experimental Design

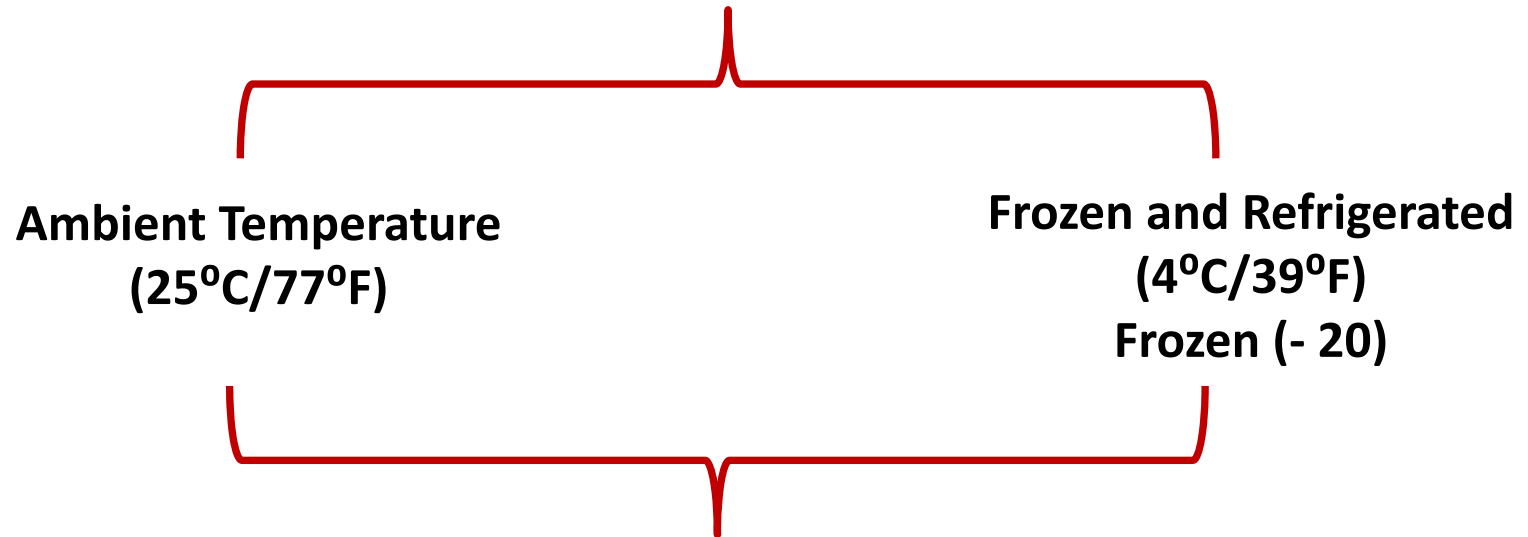
- All tortillas were made with these components and functional ingredients:

Flour, Shortening, Salt, Sodium Bicarbonate, Sodium Acid pyrophosphate (gums and emulsifiers added to prevent sticking)

- The Control formulations did not contain gums nor emulsifiers
- The test formulations included these ingredients
 - Guar Gum, Xanthan Gum, CMC, Tara Gum
 - Mono and di-glycerides

Testing Procedure

Tortillas



Ambient Temperature
(25°C/77°F)

Frozen and Refrigerated
(4°C/39°F)
Frozen (-20)

Evaluation

Moisture

pH

Appearance

Diameter

Sticking

Folding and Rollability

Storage Time
(Up to Day 21)

Guar Gum

Guar Gum Test - Results

	pH	a_w	Moisture (%)	Diameter (mm)	Rollability (Day 21)	Sticking Test ^c
Control - No Gum	5.4	0.9458	31.77	174	3	0 of 10
Guar Gum A (1:1)	5.4	0.9418	30.26	175	3	0 of 10
Guar Gum B (0.75)	5.4	0.9467	31.34	173	3	0 of 10

^cSticking evaluated based on the number of tortillas that were not easy to separate after being subjected to a 5lbs weight.



Control - NO Guar Gum



Guar Gum A and B

Guar Gum

Why is Guar gum the most common hydrocolloid used in tortilla processing

- Guar gum absorbs water during dough mixing and retains it during baking.
- Improves dough machinability and development
- Superior finished product quality
- Provides strength, flexibility & pliability
- Prevents sticking of tortillas



CONTROL (No Gum)



GUAR GUM

Xanthan Gum

Xanthan Gum Test - Results

	pH	Moisture (%)	Sticking Test ^c	Status
Control - Xanthan	5.42	33	1 of 10	Pass
Xanthan B	5.49	33	1 of 10	Pass
Xanthan C	5.48	32	6 of 10	Failed

- Xanthan gum prevents sticking and provides freeze-thaw stability. However consideration should be given to:
 - Properties of the Xanthan gum
 - How the gum was processed (process technology)
 - Particle size
 - Viscosity

CMC Gum



**CONTROL
(No Gum)**



CMC Gum

- CMC gum provides good freeze-thaw stability
- To prevent sticking it needs a synergist combination with other gums

Mono and Diglycerides

Mono and Diglycerides Test

Mono -& Di	pH	Rollability (Day 30)	Sticking Test	Texture (Day 30)
Mono and Diglyceride A	6.0	3.0	3 of 10	Soft
Mono and Diglyceride B	6.1	3.0	5 of 10	Zapping & cracking
Mono and Diglyceride C	6.0	3.0	0 of 10	Soft

- Mono and Diglyceride can prevent sticking and provides freeze-thaw stability. However consideration should be given to:
 - ✓ Source (palm, or soybean oil)
 - ✓ Ratio of Mono and Diglyceride molecules
 - ✓ Particle size
 - ✓ Heat stability
 - ✓ Acid value

Synergistic Gum Combinations

- 1) Guar, Locust Bean, & Tara Gums all help prevent tortilla sticking
- 2) CMC - Xanthan at selected ratio can help prevent sticking
- 3) Alginate does not help control sticking
- 4) Psyllium & CMC appears to intensify sticking.
- 5) Appears that Alginate, Psyllium & CMC are not suitable for tortilla applications.

Thank You



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