Flour Tortilla Extensibility and Translucency and Mono and Diglyceride Replacement

TIA 2018

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Flour
Water
Fat
Salt
Leavening
Its "Simple" right?



Tortilla Quality Problems

- Misshaped
- Lacy Edges
- Dog Ears
- Translucency
- Thin
- Sticking
- Zippering/ Flaking
- Brittle/ Bursting/ Lack of Rollability
- Dry texture and cracking
- Mold





SIMPLE.....

Ingredients: Enriched Bleached Flour (Flour, Niacin, Reduced Iron, Thiamine Mononitrate, Riboflavin, Folic Acid), Water, Vegetable Shortening (Interesterified and Hydrogenated Soybean Oils), contains 2% or less of: Salt, Sugar, Baking Soda, Sodium Acid Pyrophosphate, Distilled Monoglycerides, Enzymes, Cellulose Gum, Guar Gum, Fumaric Acid, and Calcium Propionate and Sorbic Acid (to maintain freshness), Contains: Wheat

Ingredientes: Harina blanqueada y enriquecida (harina, niacina, hierro, mononitrato de tiamina, riboflavina, ácido fólico), agua, aceite vegetal (aceites de soya interesterificado e hidrogenado), contiene 2% o menos de: sal, azúcar, bicarbonato de sodio, ácido pirosfático de sodio, monogliceridos destilados, enzimas, goma de celulosa, goma guar, ácido fumárico, y propionato de calcio y ácido sórbico (para mantener la frescura). Contiene: Trigo **INGREDIENTS:** ENRICHED BLEACHED WHEAT FLOUR (WHEAT FLOUR, NIACIN, REDUCED IRON, THIAMINE MONONITRATE, RIBOFLAVIN, FOLIC ACID), WATER, VEGETABLE SHORTENING (INTERESTERIFIED SOYBEAN OIL, HYDROGENATED SOYBEAN OIL AND/OR PALM OIL), CONTAINS 2% OR LESS OF: SALT, SUGAR, LEAVENING (SODIUM BICARBONATE, SODIUM ALUMINUM SULFATE, CORN STARCH, MONOCALCIUM PHOSPHATE AND/OR SODIUM ACID PYROPHOSPHATE, CALCIUM SULFATE). DISTILLED MONOGLYCERIDES, ENZYMES, WHEAT STARCH, CALCIUM CARBONATE, ANTIOXIDANTS (TOCOPHEROLS, ASCORBIC ACID, CITRIC ACID) CELLULOSE GUM, GUAR GUM, DOUGH CONDITIONERS (FUMARIC ACID, SODIUM METABISULFITE AND/OR MONO- AND DIGLYCERIDES), CALCIUM PROPIONATE AND SORBIC ACID (TO PRESERVE FRESHNESS). **CONTAINS: WHEAT**

Nutrition Facts Serving Size 1 Tortilla (39g)	* 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
Servings Per Container o	Total Fat Less than 65g 80g
	Sat Fat Less than 20g 25g
Amount Per Serving	Cholesterol Less than 300mg 300mg
Calories 120	Sodium Less than 2,400mg 2,400mg
Calories from Fat 35	Dietary Fiber 25g 30g
% Daily Value*	Ingredients: Enriched Flour Bleached
Total Fat 4g 6%	(wheat flour, niacin, iron, thiamin
Saturated Fat 1.5g 8%	Mononitrate, ribonavin, folic acid), water,
Trans Fat Og	and soybean oil), Glycerin, Baking
Cholesterol Omg 0%	Powder (baking soda, sodium aluminum
Sodium 270mg 11%	phosphate, tumaric acid), Corn Syrup Solide, Containe less than 2% of:
Total Carbohydrate 20g 7%	Mono and Diglycerides, Potassium
Dietary Fiber less than 1g 3%	Sorbate and Calcium Propionate
Sugars less than 1g	(preservatives), Salt, Dough Conditioner
Protein 3g	CONTAINS WHEAT INCOEDIENTS
	DIST BY CENERAL MILLS CALES INC.
Calcium 2% Iron 6%	MINNEAPOLIS, MN 55440 USA
Not a significant source of vitamin A and vitamin C.	Partially Produced with Genetic Engineering
	Learn more at Ask General Mills.com

INGREDIENTS: Enriched unbleached flour (Wheat flour, Niacin, Reduced iron, Thiamine mononitrate, Riboflavin and Folic acid). Water, Vegetable shortening (Contains one or more of the following: Palm oil and or Corn oil), Contains 2% or less of the following: Salt, Aluminum free leavening (Sodium acid pyrophosphate, Sodium bicarbonate, Corn starch, Monocalcium phosphate), Wheat protein, Preservatives (Calcium propionate, Sorbic acid), Dough conditioner (Fumaric acid, Gum blend, Lecithin, Mono and Diglycerides, Sodium metabisulphite). Allergens: Wheat and Sov

INGREDIENTES: Harina de trigo enriquecida y sin blanquear (Harina de trigo, Niacina, Hierro reducido, Mononitrato de Tiamina, Riboflavina y Acido folico), Agua, Grasa vegetal (Contiene uno o mas de los siguientes: Aceite de palma y o Aceite de maiz), Contiene 2% o menos de lo siguiente: Sal, Leudante sin aluminio (Pirofosfato acido de sodio, Bicartonato de sodio, Almidon de maiz, Fosfato monocalcico), Proteina de trigo, Conservadores (Propionato de calcio, Acido sorbico), Acondicionador de masa (Acido fumarico, Mezcla de gomas, Lecitina, Mono y digliceridos, Metabisulfito de sodio). Alergenos: Trigo y Soya ENRICHED WHEAT FLOUR (FLOUR, MALTED BARLEY FLOUR, REDUCED IRON, NIACIN, THIAMIN MONONITRATE (VITAMIN B1), RIBOFLAVIN (VITAMIN B2), FOLIC ACID), WATER, INTERESTERIFIED SOYBEAN OIL, LEAVENING (SODIUM ACID PYROPHOSPHATE, BAKING SODA, MONOCALCIUM PHOSPHATE), SAIT, CALCIUM PROPIONATE (PRESERVATIVE), MONO- AND DIGLYCERIDES, FUMARIC ACID, VEGETABLE SHORTENING (PALM OIL), AMMONIUM SULFATE, L-CYSTEINE.

MADE IN A BAKERY THAT MAY ALSO USE SOY

CONTAINS WHEAT, SOY

Functional Ingredients

Effect

- Mix Reducers
- Strengtheners
- Shelf Life Extenders/ Softeners
- Emulsifiers
 - Mono-Diglycerides
- Others: Leavening etc.

Source

- Chemicals and Synthetics
- Acids
- Gums/ Hydrocolloids
- Enzymes
- Proteins
- Fats
- Starches
- Herbs and Spices

Mix Reducers / Dough Relaxers:

Function: Reduce mix time and energy requirements by interrupting or cutting the gluten network.

Types:

- L-Cysteine, Sulfites, Sorbic Acid, Fumaric Acid
- Inactive Yeast and Glutathione
- Garlic
- Enzymes
 - Protease, Papain, Bromelain, Xylanase
- Protein Isolates

Mix Reducers / Dough Relaxers:



Mixing Development with Mix Reducers









Mix Reducers / Dough Relaxers:

Product Improvements:

- Improve dough extensibility
- Reduce dough temperature
- Reduce resistance to pressing and reduce "lacy" edges.
- Reduce shrink back and curling of edges.
- Improve finished product shape
- Can reduce translucency when optimized
 Other:
- Can create sticky, wet dough
- Can tenderize the finished tortilla
- Can cause more color

Strengtheners/Oxidizers

Function: Increase gluten formation and dough strength by improving gluten bonds.

Types

- Vital Wheat Gluten
- DATEM and Ethoxylated Mono-glycerides
- Ascorbic Acid
- Enzymes
 - Glucose Oxidase, Phospholipase, Xylanase, Transglutaminase
- Protein Isolates
- Soy Flour

Strengtheners

Product Improvements:

- Increase dough elasticity
- Increase dough cohesiveness
- Improve webbing strength in die cut processes
- Reduce vital wheat gluten and improve flour quality
- Increase product toughness and decrease bursting
- Can reduce cracking and flaking when flour quality is poor Other:
- Can increase shrink back and resistance to pressing.
- Can increase translucency
- Increase chewiness and toughen the product.

Shelf Life Extenders / Softeners

Function: Improve or extend product freshness.

Туре

- Fat
- 🗕 Sugar
- Emulsifiers
- Starches
- Enzymes
 - Amylase, Lipase, Xylanase
- Gums and Hydrocolloids

Extensibility/Toughness Analysis by Texture Analyzer



Shelf Life Extenders / Softeners

Product Improvements:

- Improve rollability
- Reduce bursting
- Improve softness of bite
- Improve moisture retention
- Improve overall product texture

Other:

- Can tenderize the product
- Can create more color/ toast points

Emulsifiers

Function: Stabilize Oil in Water or Water in Oil Suspension.

Туре

- Mono and di-glycerides, SSL, CSL, DATEM,
- Lecithin
- Some Gums and Hydrocolloids
- Enzymes
 - Lipase, Phospholipase
- Protein Isolates

Common Emulsifiers in Baking



https://www.pharmatutor.org/articles/surfactants-basics-versatility-in-food-industries?page=2%2C1

Emulsifiers

Product Improvements:

- Reduce dough tackiness
- Improve dough stability and strength
- Improve finished product texture
- Improve moisture retention and reduce staling rate.
- Reduce finished product sticking
- Can reduce translucency when optimized
 Other:
- Increase tenderness in finished product
- Can create waxy mouthfeel



Emuslification: Surface Tension Reduction

- Polar, Hydrophilic, Water Loving (Glycerol) Head
- Non-Polar, Lipophilic, Fat Loving (Fatty Acid) Tail
- Allows Water and Oil/Fat to mix and stabilize together.
 - Reduces sticking: dough and tortilla (stacking)
 - Retains moisture: softening
 - Improves machinability
 - Improves texture
 - Increases leavening: Gas Retention



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https://alchetron.com/Surfactant-4682337-W

Softening: Starch – Lipid Complexing

- The starch-lipid complexing improves softening by reducing the ability of amylose to retrograde over time
 - This is similar to the mechanism by which Monodiglycerides and SSL function.



Function of lipase image: <a href="http://biology-thedigestivesystem.blogspot.com/2012/11/state-source-substrate-products-and.html#!/2012/11/state-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-source-substrate-sourc

Reducing Sticking

Adhesion

Two <u>different</u> substances "sticking" together chemically usually through hydrogen bonding

Water sticking to dough

Cohesion

- Two <u>like</u> substances sticking together through hydrogen bonding.
- Water sticking to water



Emulsifiers – Mono and diglycerides

Function

- Reduce dough tackiness
- Reduce Translucency
- Increase tenderness in finished product
- Improve finished product texture
- Improve moisture retention and reduce staling rate.
- Reduce finished product sticking

Replacement Options

- Enzymes
- Hydrocolloids/ Gums/ Proteins
- Fats
- Lecithin
- Processing



Hydrocolloids/ Gums

- Gum Arabic (Acacia Gum), Guar Gum, Cellulose Gum etc. Highly Hydrophilic
- Bind water, can reduce free water
- Can form films around oil droplets or increase viscosity to reduce oil and water coalescence or separation



Hydrocolloids as emulsifiers and emulsion stabilizers; Procter Department of Food Science, University of Leeds, Leeds LS2 9JT, UK; Eric Dickinson; 6 June 2008

Fats and Oils

- Butter
- Tallow
- Lard
- Palm Oil
- Soybean/ Vegetable Oil and Shortening
- Key Attributes:
- Plastic or Liquid
 - Melt Point/Drop Point
 - Saturation

Lecithin

- Lecithin : natural emulsifier
 - Egg and soy , sunflower or canola
 - Available for Organic
- Unique properties can be adjusted to be more hydrophilic or hydrophobic
- Will stabilize oil in water emulsion and can help reduce adhesion
- Can complex with gluten to improve strength, rollability and stretch
- Improves moisture retention through shelf life

Process and Packaging

- When eliminating mono and diglycerides you may also need to adjust your processing parameters to reduce finished product sticking in the package.
- Factors that effect sticking:
 - Press Pressure and Temperature
 - Stiff, elastic dough needs more heat and pressure to meet size requirements
 - This causes gelatinization and fires leavening
 - Tortillas will puff and create weak points
 - Under Baking
 - Increased moisture levels
 - Over Baking
 - Pillowing
 - Insufficient cooling time or temperature
 - Finished Product should be +/- 10°F of the packaging room
 - Low relative humidity
 - Excessive stacking or compression

Other Functional Ingredients

- Leavening
- Sugar (Sucrose) and Dextrose
- Starch, Modified Starch
- Alternative Flours
- Fiber and Nutrients
- Organic/Non-GMO/Natural

THANK YOU! QUESTIONS?