# TIA Technical conference Amsterdam

# Making tortilla for East Europe Market -How to extend shelf life and maintain a high quality of wheat tortilla



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#### Shelf life of tortilla

Comparison shelf life of the tortilla on the market in different countries.

- $\checkmark$  Shelf life of tortilla in USA mostly is 3-4 weeks.
- $\checkmark$  Shelf life of tortilla in Europe is from few months to 1 years.





#### Factors that affect shelf life of tortilla

- ✓ Hygiene
- ✓ GMP
- ✓ Moisture
- ✓ Water activity
- ✓ pH
- ✓ Preservatives
- ✓ MAP Packaging







#### GMP

Shelf life of tortillas depends not only on the best by date on the packaging

- ✓ Ingredients
- ✓ Formulation
- ✓ Process





#### Remarks on the quality of the tortilla

- $\checkmark$  Notice any spots of mold on their surface
- Senses are usually the most reliable instruments that tortillas have expired
  rancidity
- ✓ Sticking





#### **Quality Problem- Mold growth**

- Lack of sanitation practices, problems with production practices
- Recycling of unfiltered air in the bakery increases the changes of mold spores.
   Problems with bacterial/mold population in area
- ✓ Possible problems with pH
- $\checkmark$  Possible problems with preservatives





### **Preventing rancidity**

- $\checkmark$  Choosing the right fat
  - Unsaturated fats tend to have a shorter shelf life
  - Saturated fats are more stable
- Avoid exposure to oxygen
  -MAP packaging for long shelf life, > 3 months





#### Choosing the right fat for longer shelf life of tortilla

- ✓ Coconut oil, palm oil, canola oil avocado oil (12mounth –shelf life)
- ✓ Corn oil (9-12 mounth –shelf life )
- ✓ Olive oil , macadamia oil, almond oil (6-12 mounth –shelf life )
- ✓ Soyabean oil, penaut oil (6 mounth –shelf life)
- ✓ Grape seeds oil, sunflower oil (3 mounth –shelf life)





#### **Prevent microbiological contamination**

- ✓ Reduction of microbiological contamination by baking in ovens at high temperatures more of 200 °C.
- ✓ Ovens sanitize
- ✓ Education people how to prevent product of microbiological contamination
- ✓ Practice high hygienic practice



#### **Definitions of preservatives**

Preservatives are antimicrobial agents used to preserve food by preventing the growth of microorganisms such as mold, yeast and bacteria.



#### **Forms of preservation**

- ✓ Artificial
- ✓ Clean label
- ✓ pH Acidic
- ✓ Reducing water activity (aW)
- ✓ Modified atmospheric packaging
- ✓ UV Light
- $\checkmark$  Irradiation
- ✓ Freezing, refrigeration
- ✓ Fermentation





#### **Types of preservatives**

✓ <u>Propionates</u>
 Calcium propionate
 Sodium propionate
 Propionic acid

✓ <u>Sorbates</u>
 Potassium sorbate
 Sorbic acid

#### ✓ Fermentation

Cultured dairy whey Cultured wheat Cultured corn syrup solids









#### **Cumulative effect of preservatives and acids**



#### **Effect of commercial preservatives**



#### **Preservatives and acidulants**

	Chemical	Comment	Desidention lances		
Enumber	Compound	Comment	Production issues	Canada	Europe
E201-203	benzoic acid, sodium benzoate	used in acidic foods such as jams, salad dressing, juices, pickles, carbonated drinks	ineffective, requires low pH < 5		
E270	lactic acid	used as a food preservative, curing agent and flavoring agent	Reacts with leavening, must be encapsulated		NA
E280 - 283	propionic acid and calcium and sodium propionate	baked goods	Calcium most common form	2000 ppm	2000 ppm
E200 - 203	sorbic acid, potassium or sodium sorbate	common for cheese, wine, chemical leavened baked goods	Sorbic acid helps lower pH, potassium sorbate highly soluble	2000 ppm	2000 ppm
E 297	fumaric acid	used in beverages and baking powders, substitute for tartaric acid and citric acid.	Use "hot water soluble" slower solubility, protects leavening		NA
E 330	citric acid	a natural* preservative/conservative which occurs naturally in citrus fruits and is also used to add an acidic or sour taste to foods and drinks.	Reacts with leavening, must be encapsulated. Label friendly		NA
E 296	malic acid	generally used in beverages, bakery and candy It is generally used as a substitute for fumaric acid and occasionally in place of citric acid.	Reacts with leavening, must be encapsulated		NA

#### **Antimicrobials**

Disrupts cell membrane function (mold, certain type of bacteria) ✓ **Propionic acid** 

Disrupts cell membrane function/inhibits enzymes/inhibits bacterial spore germination (yeasts, molds, certain type of bacteria).

✓ Sorbic acid

Disrupts cell membrane function (bacteria, yeasts, some mold)

- ✓ Acetic acid,
- ✓ Benzoic acid

linhibits enzymes/ disrupts cell membrane function (bacteria, primarily Clostridium botulinum)

✓ Nitrates



## Acidulates

- ✓ Citric acid
- ✓ Malic acid
- ✓ Fumaric acid
- ✓ Vinegar / acetic acid







#### Shelf life dependency on acid

- ✓ pH < 5.5 gives > 21 days
- ✓ pH 6 gives 7 to 14 days
- ✓ pH 7 gives < 7 days



 $\checkmark As \ pH$  decreases (becomes more acidic) shelf life increases

✓ pH 4.8 – 5.5 is the optimal spot for extending product shelf life



# Solubility rates of ingredients that contribute to the final pH



- -Same pH of samples of tortilla
- -Sprayed with a solution of Bromocresol Purple
- -Low pH (yellow spots) of acid that did not completely dissolve in the tortilla.
- High pH (blue spots) of sodium bicarbonate that did not completely dissolve



#### **Modified Atmosphere Packing- MAP**

- ✓ Modified Atmosphere Packing (MAP) is long established and continuosly increasing technique for extending the shelf-life of f food .
- ✓ MAP requires specialized machinery to flush out air from the packing and replace it with a different gas or gas mixture .
- The MAP packing to provide longer shelf life, maintains sensory attributes like color or appearance and achieve the food safety of the product.
- ✓ The normal composition of air is 21% oxygen, 76% nitrogen and less than 0,1% carbon dioxide
- Reducing the oxygen content while increasing the level of Carbone dioxide and & or nitrogen has been shown to significantly extend the shelf –life at cold temperate of storage.



#### **Machines used in MAP**

Thermo-Forming machines





Thermo-forming machine

# **Packiging material**

- Mainly used plastic foils are polyethylene(PE), polyamide (naylons), polyethylenetetraphthalate(PET), polyvinilchloride(PVC), ethylene vinyl alcohol(EVOH) and polyvinylidene chloride (PVdC).
- The packing material should be hold properties like: ease of manufacturing , clearity, heat sealing and strength.











## Adventage of MAP

- ✓ Longer shelf life
- $\checkmark\,$  Reduces the growth of mold
- $\checkmark\,$  Retained taste, vitamin and fat content
- $\checkmark$  The natural color is preserved



## Limitation of modified atmosfers

#### ✓ High complexity

Possible failures include : incorrect gas composition, leaks due to faulty temperature or pressure distribution, seal contamination or defective material.

#### ✓Cost

Packaging films, consumption of gas and the personnel costs.

#### ✓Influence on product quality

Excessively high concentration of CO2 can be absorbed by the tortilla and make it sour. High oxygen concentration, problem with mold and change color of tortilla (tomato, spinach).



## **Testing MAP**

- ✓ Quality control of modified atmosphere food packaging (MAP) with the oxygen / CO<sub>2</sub> hand held gas analyzer for analysis of modified atmospheres in food packages (MAP).
- ✓ Monitoring of sample for time of shelf life.
- $\checkmark$  Check sealing on the bag by red test indicators





#### Conclusion

Ways to extend shelf life and maintain the quality of tortilla:

✓GMP (high level hygiene in productiom)

- ✓ Reduce ambient airflow
- ✓ Increase preservative level
- ✓ Proper formulation and choosing ingredents
- ✓ Decrease water activity tortilla 0.95-0.98
- ✓ Optimal pH, decrease pH, add more acid
- ✓ Minimize cooling / packing contamination



#### Conclusion

Ways to extend shelf life and maintain the quality of tortilla:

✓MAP packaking

✓ Proper packaking material

✓Decrease tortilla storage temperatures



