

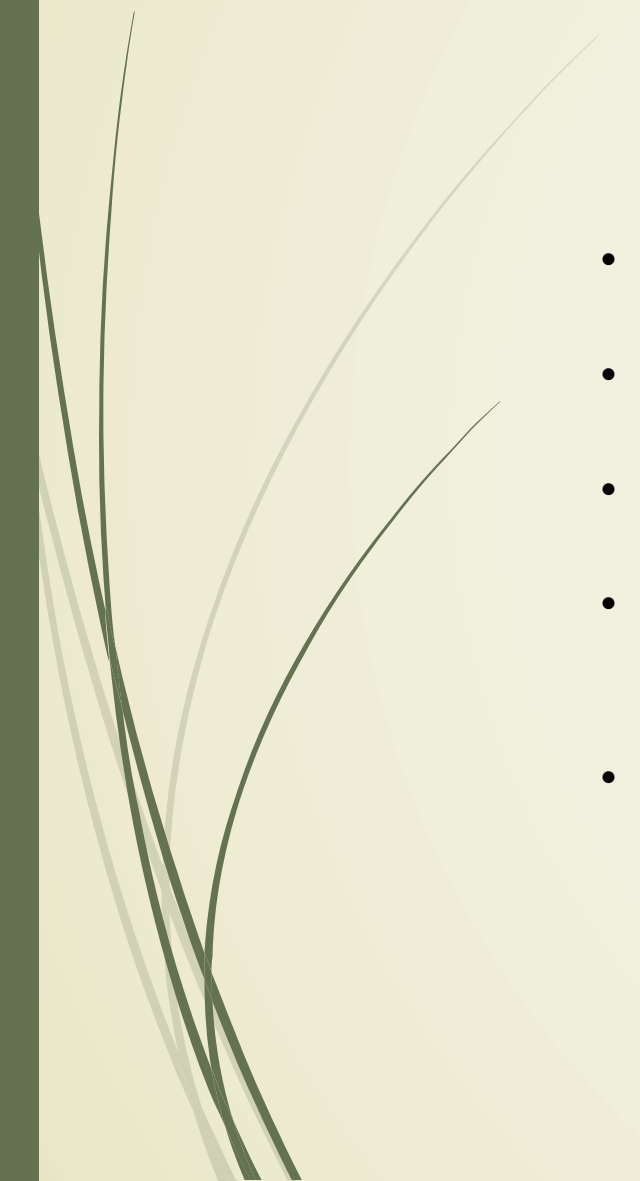


CORN VARIETIES & THE PRODUCTION CHIPS

BY MÓNICA BARRIOS A



SUMMARY

- Introduction
 - Corn composition / Endosperm: Mealy & Hurny
 - Measurement parameters
 - How impact the Gelatinization process in the final product
 - Types of corn
- 

CORN: A LITTLE HISTORY



It's origin dates back to 7000 years approx. In the area of Mexico and Guatemala

Wild cultivation to domesticated plant of value.

- Increase in corn kernels (60 to 500).
- Increase in length (2.5 to 30 cm)

Currently it is cultivated throughout the world, there is an improvement of corn through the development of hybrids with higher yield, stability and better agronomic characteristics.



STRUCTURE AND CONSTITUTION OF THE CORN GRAIN

➤ 2 -3% - Oil

➤ 13% - Water (Humidity)

➤ 84% - Solids



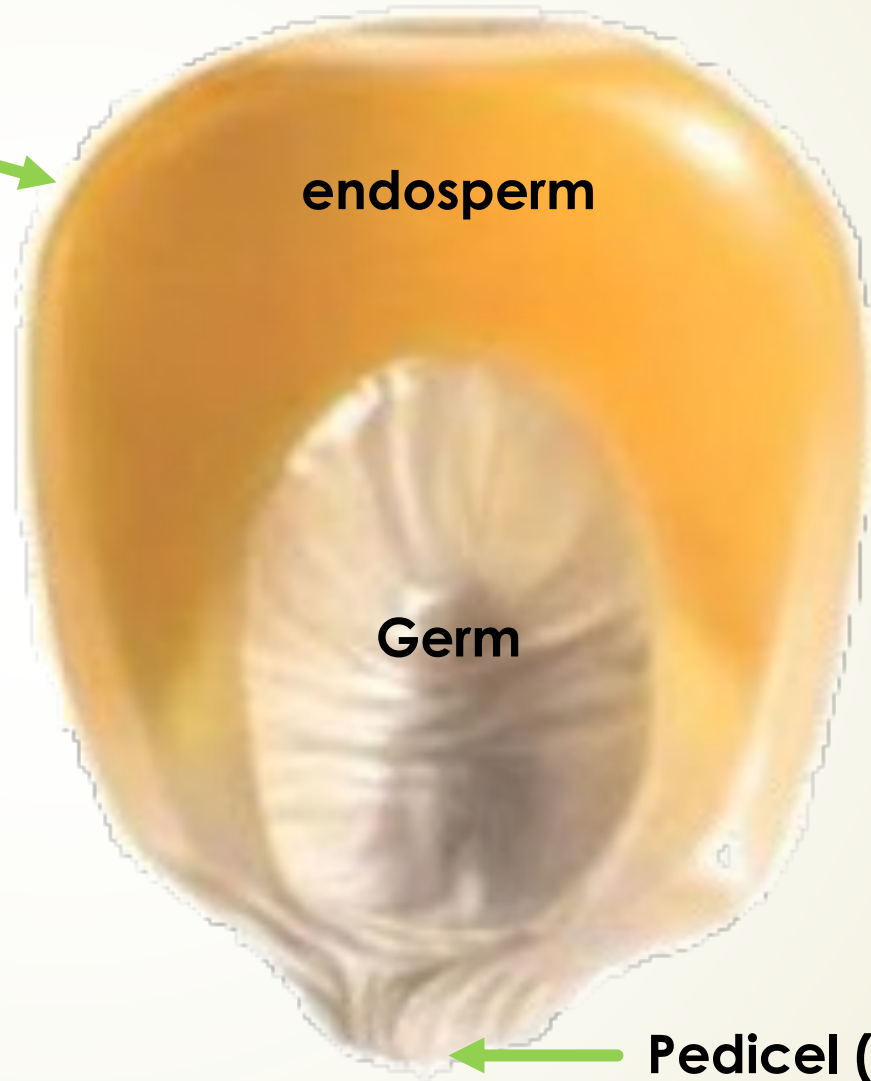
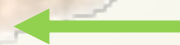
Pericarp



endosperm

Germ

Pedicle (TIP CAP)





PERICARP

High in:

- Crude fiber.
- Lipids, especially waxes

It is removed in the cooking process

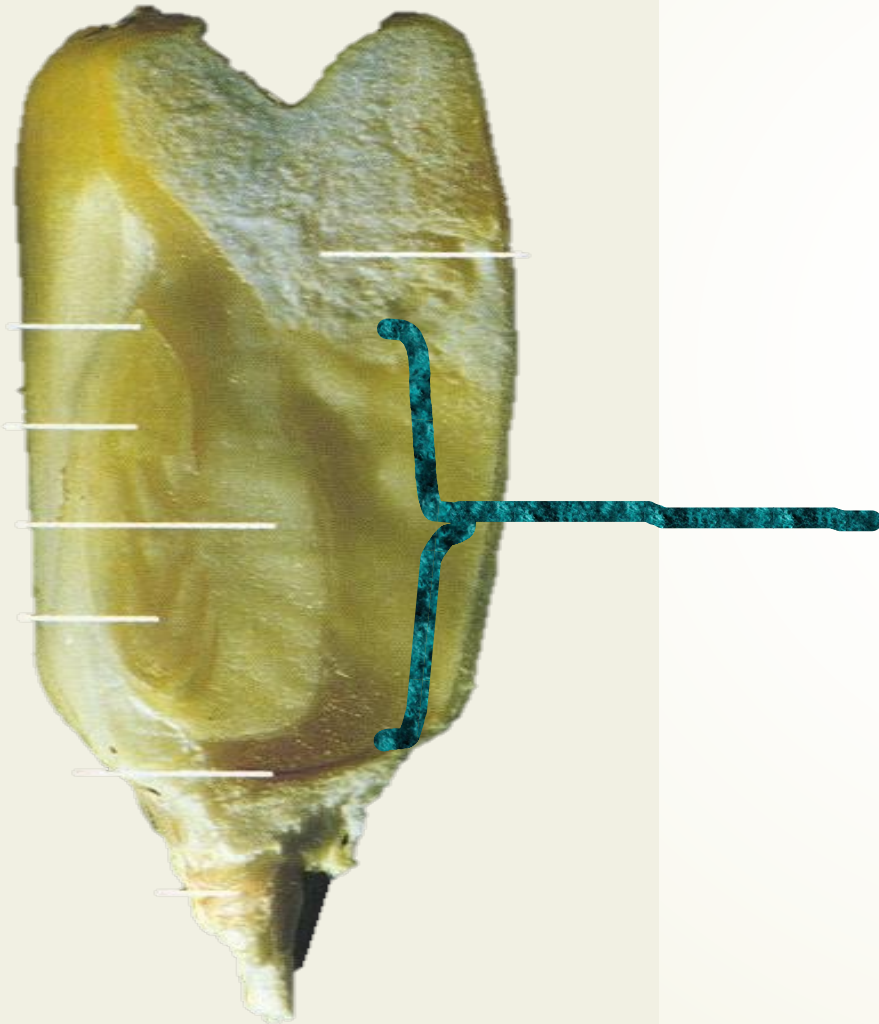


TIP CAP

Regularly removed in the food industry

- Contribution of fiber and natural appearance in the final products.
- In excess, it can give an appearance of dirty or not very fresh.

GERM

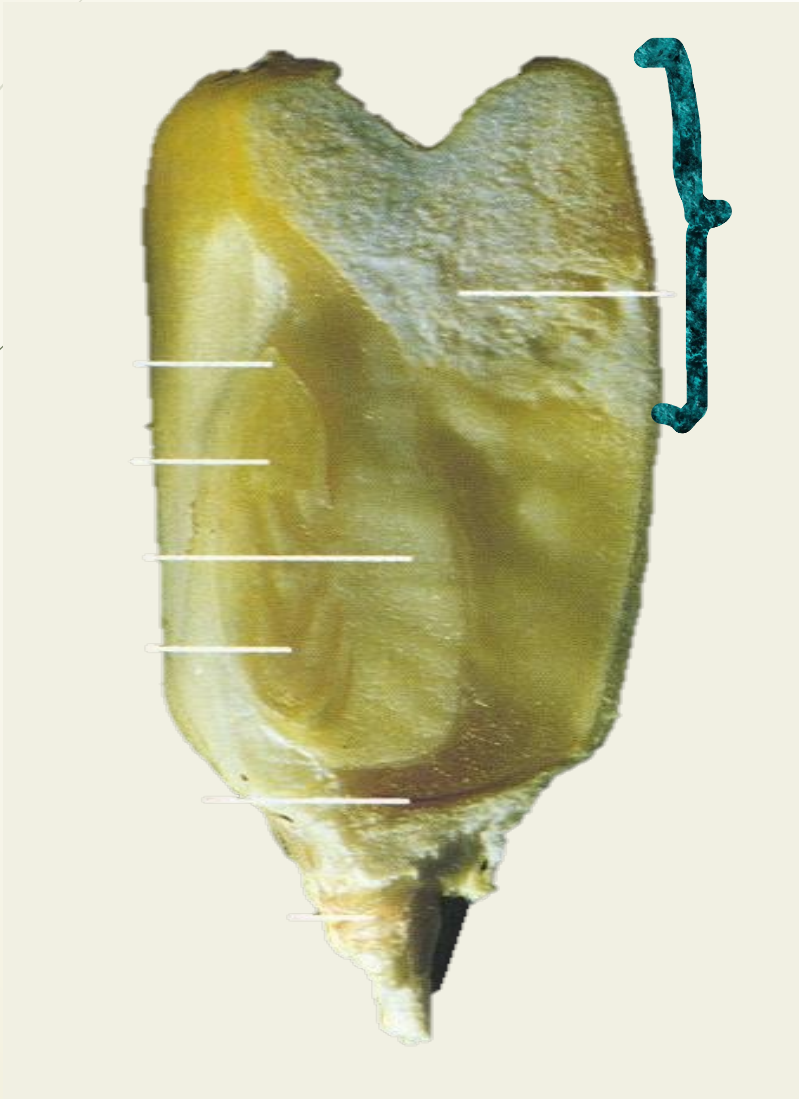


Living part of the grain, which has an emulsifying action when the milling process is carried out

High content of :

- Protein.
- Sugars
- Oil.
- Enzymes.
- Vitamins and minerals.

ENDOSPERM



Composed of the mealy and the horny

Represents 83% dry grain weight

High in:

- Starch.
- Protein.

MEALY ENDOSPERM (SOFT)

- Higher proportion of amylose: gelatinizes faster than amylopectin, causing sticky masses, difficult to laminate, defects in the shape and size of the tortilla.
- It is generally related to the softness of the grain, the opacity and the milky appearance.
- The grain is used as consumption in the daily diet.



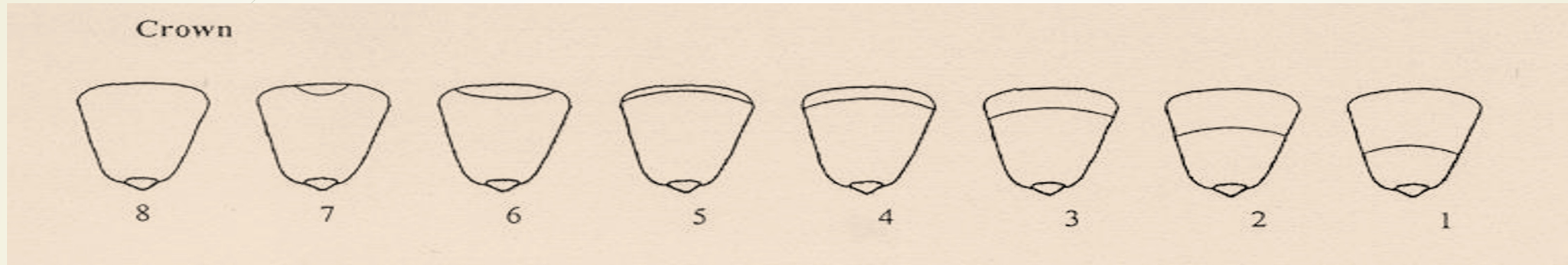
CORNEAL ENDOSPERM

- Higher proportion of amylopectin: also called “hard” endosperm and they show technological advantages in the elaboration of tortillas due to the contribution of color and structure of the dough.
- Generally related to the hardness and density of the grain, crystallinity and vitreous appearance.
- It facilitates the obtaining of “GRIT” semolina

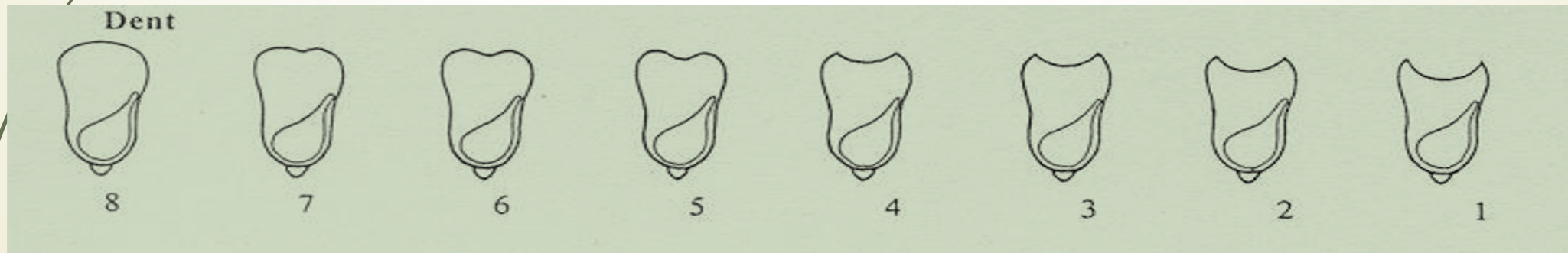
(+) % ←—————→ (-) %



SMOOTH / TOOTHED CROWN



(-) ————— breaking strength —————> (+)



The deeper the basin in the crown, the softer the corn.

Critical grain measurement parameters

Parameters	Impact
% grain moisture	Quality grain / Efficiency process
% small grain (< mesh 1/4")	Efficiency process
% grain ball	Appearance and texture
% broken / crashed grain	Dough texture / Oil absorption
% stress crack	Dough Texture / Efficiency process
Impurities	Appearance / Oil absorption / Equipment Damage / Consumer Complaints
Foreign matter	Equipment Damage / Consumer Complaints

Gelatinization

It is a process of hydration by means of heat, causing changes in the properties of the starch.

Humidity

30°C
Surface
humidity of
the grain.

40°C The
internal
structure of
the grain
begins to
break down.

60°C
Structure
rupture is
complete.

65°C
Amylose
starts to
come out of
the grain.

70°C
Optimum
amylose
output.

90°C
Optimum
degree of
gelatinization

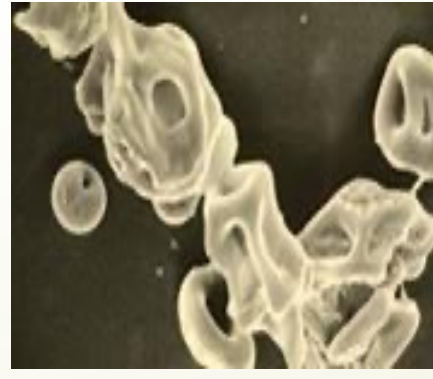
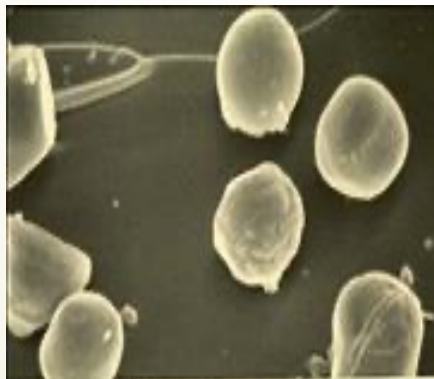
>95°C
* Grain break

* > amylose
extraction

Temperature

Gelatinization level

	low gelatinization	Ideal gelatinization	high gelatinization
DOUGH	grainy and dry	soft and manageable	sticky and hot
FINISHED PRODUCT	<ul style="list-style-type: none">• Flat and brittle flakes• holes• glassy texture	<ul style="list-style-type: none">• full flakes• suitable bubbles• crispy texture	<ul style="list-style-type: none">• tortilla cutout• laminate defects• hard texture



TYPES OF CORN

HARD CORN

Most abundant crop in the tropics

Greater proportion of horny endosperm, grows in moist and cold soils.

More resistant to damage by insects and fungi .

Human consumption and production of corn starch .

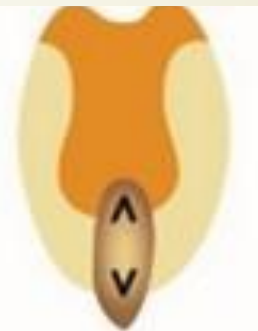
Yellow variety – orange and white – creamy

Round and strong grains but soft to the touch



DENTATED CORN

- Limited horny endosperm on the sides
- Greater performance in production processes
- More susceptible to damage by fungi and insects and the drying process is slower than hard.
- Yellow varieties – animal and industrial consumption
- White varieties – human consumption



CONTINUOUS IMPROVEMENT PROCESS



SEED HOUSES



ANALYSIS AND
DEFINITION OF
VARIETIES



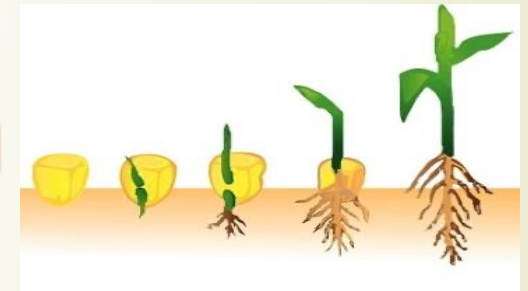
R&D PRE-ANALYSIS



FEEDBACK TO
FARMERS



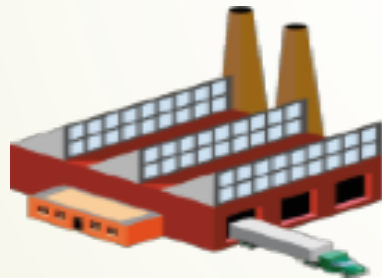
LAUNCH OF NEW
VARIETIES



SOWING IN THE FIELD



PURCHASE AND
STORAGE



TEST RUN IN PROCESSES



SENSORY VALIDATION
R&D



TYPES OF COOKING



HUMID: NIXTAMALIZATION

- Corn cooking process par excellence with ancestral origins for the production of masses and good quality products with a natural appearance.
- Cooking in industrial pots to achieve the gelatinization of starches, with the addition of water, lime and the supply of heat to later rest the corn in the cooking water between 10 – 14h.



DRY

dough maker

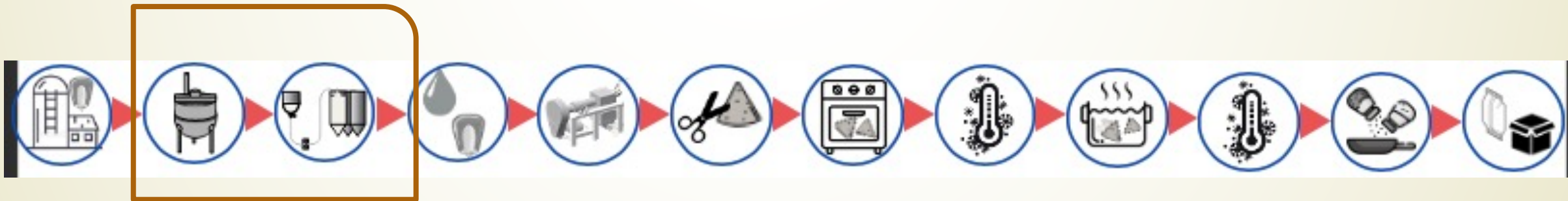
- Gelatinization of corn starches by means of mechanical devices that generate heat by friction between grains and the equipment, with the addition of lime and a minimum amount of water.

dough flour

- 
- Process of obtaining dough from the mixture of nixtamalized flours and water.

NIXTAMALIZATION PROCESS

- Homogeneous cooking of corn
- Proper gelatinization of starches
- Effective process for removing husks and impurities from corn
- Obtaining a crunchy texture and natural flavor by absorbing lime



DOUGH MAKER SYSTEM

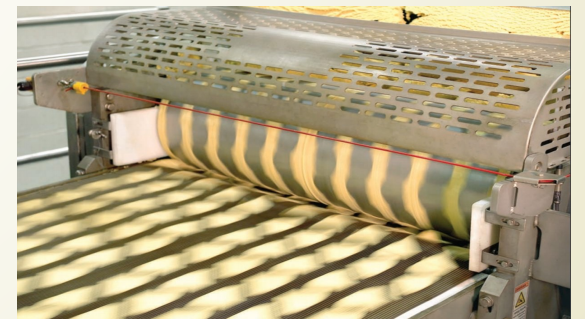
- Create fresh , high quality mass in a fraction of the time compared to traditional systems .
- Until dry corn to fresh dough in minutes not hours , applies to technology to varying corn types to make a variety of corn masses that do not require cooking , simmering or soaking .
- Does not use high water consumption and eliminates wastewater to be treated

Clean dry corn



6–20 minutes
processing Time.

Fresh dough ready for
production of quality corn
products



PROCESS COMPARISON

		MASA MAKER	TRADITIONAL	MASA FLOUR
Water consumption		LOW Product recipe and sanitation	HIGH Simmering, soaking, washing, product recipe and sanitation	LOW Product recipe and sanitation
Effluent		-	HIGH	-
Steam		-	Steam REQUIRED	-
Raw material cost		LOW Market value of raw corn	LOW Market value of raw corn	HIGH Cost of pre-cooked corn flour
Production time <small>*dependent on product characteristics</small>		25-30 minutes*	8-16 hours	6-10 minutes*
Production cost		LOWEST	HIGH	HIGHEST


PRODUCT COMPARISON

	DOUGH MAKER	traditional	FLOWER DOUGH
COLOR	UNIFORM AND SMOOTH	NATURAL (BLACK SPOTS) ORGANIC APPEARANCE	UNIFORM AND SMOOTH
FORM	SMALL VARIATIONS	SMALL VARIATIONS	UNIFORM
TEXTURE	CRISPY +++ BUBBLES +++ CLUMPY FEELING	CRISPY +++ BUBBLES +++ -	CRISPY +++ BUBBLES ++ SLIGHT ADHERENCE IN TEETH
TASTE	SLIGHT BITTER AFTERNOON	NATURAL OMELETTE	FLOUR



CONCLUSION

The market tendency, the consumer and the available resources are the base for develop new technologies and to select the best kind of corn.



THANK YOU