

TORTILLA-TORTILLA CHIPS





Cereals Processing Toolkit



TORTILLA- TORTILLA CHIPS

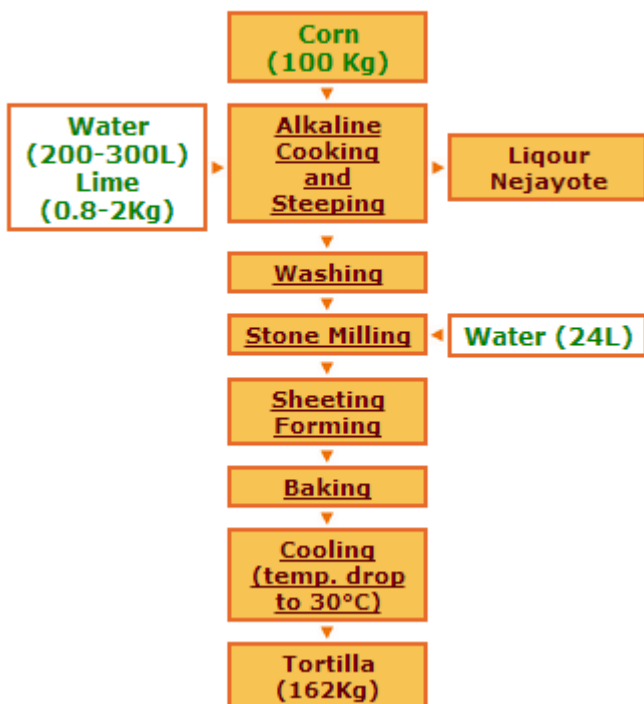
1.- Tortilla - General Information

Tortilla is the most important corn food in Mexico, Central America, Venezuela, and Colombia. In Mexico, nearly 52% of the corn is used for human food, mainly in the form of nixtamalized (lime-cooked) products. In particular, the lower socioeconomic groups depend on tortillas as the main source of calories and protein.

The technology for tortilla production has been transmitted from generation to generation in Mesoamerica. In Central America and Mexico, many tortillas are still made by the ancient Aztec technology. In the traditional tortilla preparation, corn is lime-cooked in pots over a fire and steeped, to form the nixtamal. The nixtamal is washed by hand or with mechanical washers to remove the skin, or pericarp, and then ground on a stone grinder (called "metate") to form the masa. Small portion of masa are formed by hand into a flat cake, which is baked on a flat stone used as a griddle, called comal. The resulting tortillas are round flat products, of about 20 cm in diameter. Recent tortilla production technologies include modern machinery, for less labour and continuous processing, but the same principles are still followed.

2.- Tortilla Processing details

Tortilla Processing Details



2.1.-Cooking and Steeping

Production begins with the alkaline cooking of good quality whole corn, for up to 3 hours at 80 to 100°C with frequent stirring. Corn is cooked in 120 – 300% excess water containing 0.1-2.0% hydrated lime. After cooking, the corn is steeped for 8 to 16 hours (usually overnight).

2.2.-Washing

After steeping, the nixtamal and steeping liquor are transferred to mechanical washers or washed by hands. Most commercial washers are rotating barrels or drums that rinse the nixtamal with pressurized water. Pericarp and excess lime are washed away from the nixtamal.

2.3.-Stone Milling

The clean nixtamal is ground using a system of two matched carved stones; one is stationary and the other rotates at 500-700 rpm. The material is forced into a center opening and into the gap between the stones, and then travels outwards from the center to the perimeter of the stones.

The typical stone is 10 cm thick, 40 cm in diameter, and carved radially. The grooves become progressively shallower as they approach the perimeter. For tortilla production, the stones have shallow grooves, and the gap between the stones is set to increase the pressure applied, in order to produce a finer masa. During grinding, water is usually added with nixtamal (approximately 6 to 12 L water added for each 100Kg of masa, depending on the grinder capacity); it cools the stones and helps preventing excessive wear, while increases the masa moisture content to the optimum for sheeting. The physical properties and machinability of the dough are directly influenced by the particle size and moisture content. Masa with fine particles and high moisture content is more easily sheeted into a thin layer.

2.4.-Sheeting / Forming

Before forming, the masa leaving the grinding process must be kneaded into a more plastic dough. This operation is usually performed in mixers, although extruders can be successfully used. The plastic masa is sheeted into a thin layer, which is then cut.

On commercial productions, the masa is fed onto a pair of smooth rollers, which are usually coated with Teflon and rotate in different directions, forcing the dough towards the gap between them. This gap is adjustable, so that products of different thicknesses can be produced. The thickness of the sheet determines the final product weight. Table tortillas of 15 cm diameter generally weigh 28-30g.

During sheeting process, the masa is forced between the rolls and is separated by wires located on the front and back rolls. The back wire cleans the sheeted masa from the back roll and allows it to adhere to the front roll, and the front wire strips the masa pieces from the roll. The cutter rotates underneath the front roll. Different cutter configurations are used for various products. Heads that cut single, double, or even quadruple rows of tortillas exist in the market. Copper or plastic bands surround the end of the first roll and help recycle excess masa. The shaped masa pieces leaving the front roller are ready for baking.

2.5.-Baking

Gas-fired ovens are normally used to bake shaped masa into tortillas, although the selection of an oven depends upon the capacity of the tortilla head. Generally, tortillas are baked at temperatures ranging from 280 to 315°C, and the baking time varies from 20 to 40 sec.

2.6.-Cooling

Baked tortillas may be placed on cooling racks, or move through a series of open tiers, for cooling. The shelf life of tortillas greatly depends on the effectiveness of this step. Tortillas are cooled for about 3-5 min, to decrease the temperature from 94-100°C to 25°C. Improper cooling before packaging causes microbial problems and the tortillas may stick together and become soggy as a result of moisture condensation in the package. Some cooling conveyors are supplied with fans to speed up the cooling. However, increased air movement causes more microbial contamination, which significantly affects shelf life.

3.- Tortilla chips - General Information

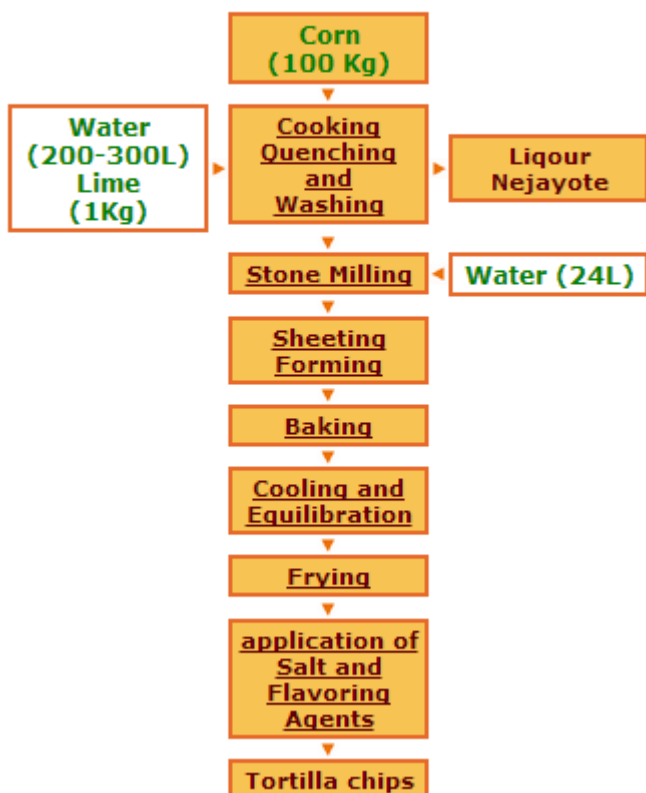
In the U.S., frying has expanded the market for masa-based foods, because the final product has excellent taste and texture and a long shelf life.

Tortilla chips are baked before being fried, and therefore they absorb less oil and have a firmer texture and a stronger alkaline flavour than corn chips.

Masa for tortilla chips is usually cut into triangles or small circles and then baked, fried, salted, and flavoured.

4.- Tortilla chips - Processing details

Tortilla chips Processing Details



4.1.-Alkaline Cooking, Quenching and Washing

Cooking corn for chips production is done in the same way as showed for tortillas' processing. Nixtamal to be processed into fried products is generally less cooked than for table tortillas. To prevent excess water uptake, snack food processors often quench or drop the cooking liquor temperature to about 68-72°C.

The lower steeping temperature decreases the extent of cooking in the nixtamal, producing a more consistent masa, with lower moisture content, which is necessary to produce chips with reduced oil content. After steeping, nixtamal is washed exactly as described for tortillas, to remove pericarp and excess lime.

4.2.-Stone Milling

Masa to be used for fried products is ground more coarsely than masa for table tortillas; therefore, the stones are carved with deeper groves and the gap is set to allow coarse grinding. Coarse masa allows steam to escape through many small pores during baking and frying. If finely ground masa is fried, bubbles or blisters form; these are considered a serious quality defect. Chips with blisters are fragile, tend to break during packaging, and have higher oil content.

4.3.-Forming and Sheeting

Different masa cutters exist for the production of various snack configurations (circular, triangular, pie-shaper, etc.). It operates exactly as showed for tortillas, but cutting smaller pieces and generating less or no rework. Most common shapes are circular and triangular pieces. This product may go straight to the fryer, to produce what is called "corn chips". Corn chips are different in texture and have a higher oil absorption compared to tortilla chips.

4.4.-Baking

Most of the fried snacks produced today are baked before being fried, in order to enhance the alkaline flavour and reduce oil uptake during frying. Baking of tortilla chips generally follows the same for table tortillas.

4.5.-Cooling and Equilibration

Tortillas pieces are sometimes equilibrated for up to 20 min before frying. However, in many operations equilibration is not used. Commercial equilibrating conveyors are similar to the cooling racks described in the tortillas processing. Equilibration produces uniform consistency and reduces blistering during frying. During cooling and equilibration, the tortilla pieces lose additional moisture (up to 3%), and the moisture within each piece become more evenly distributed.

4.6.-Frying

Most commercial fryers are continuous types with direct or indirect heating elements. Indirect-fire fryers are more expensive but more efficient, with lower operational cost. Modern fryers are designed to continuously filter out fines and facilitate cleaning.

The frying temperature and residence time depend on the type of product. Masa and tortilla pieces from yellow maize require a lower frying temperature and a longer residence time than masa from white or blended white and yellow corn. Tortilla chips are generally fried at temperatures of 178 – 185°C for 60 - 120 sec.

4.7.-Application of Salt and Flavoring Agents

Salt and flavouring agents are applied immediately after frying. The hot chips are conveyed into rotating cylinder or drums equipped with powder dispensers or a spraying system, where a liquid seasoning mix is used. Manual application is not recommended due to its non-uniform distribution.

Generally, the liquid mix consists of hot oil, salt, seasoning, and flavouring and colourings agents. Upon cooling the oil crystallizes, forming the seasoning coat. Salt can also be deposited on tortilla chips as a liquid spray or by a granulated salt dispenser positioned over the conveying belts after the tumbling operation. The amount of salt generally added to corn and tortilla chips is 1.5 and 1.0%, respectively.