

## Effects of Soaking of Maize on the Viscosity of Masa and Tortilla Physical Properties at Different Nixtamalization Times

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**Abstract :** Maize tortillas are a staple food in Mexico which are mostly made by nixtamalization, which includes the cooking and steeping of maize kernels in alkaline conditions. The cooking step in nixtamalization demands a lot of energy and also generates nejayote, a water pollutant, at the end of the process. The aim of this study was to reduce the cooking time by adding a maize soaking step before nixtamalization while maintaining the quality properties of masa and tortillas. Maize kernels were soaked for 36 h to increase moisture up to 36%. Then, the effect of different cooking times (0, 5, 10, 15, 20, 20, 25, 30, 35, 45-control and 50 minutes) was evaluated on viscosity profile (RVA) of masa to select the treatments with a profile similar or equal to control. All treatments were left steeping overnight and had the same milling conditions. Treatments selected were 20- and 25-min cooking times which had similar values for pasting temperature (79.23°C and 80.23°C), Maximum Viscosity (105.88 Cp and 96.25 Cp) and Final Viscosity (188.5 Cp and 174 Cp) to those of 45 min-control (77.65 °C, 110.08 Cp, and 186.70 Cp, respectively). Afterward, tortillas were produced with the chosen treatments (20 and 25 min) and for control, then were analyzed for texture, damage starch, colorimetry, thickness, and average diameter. Colorimetric analysis of tortillas only showed significant differences for yellow/blue coordinates (b\* parameter) at 20 min (0.885), unlike the 25-minute treatment (1.122). Luminosity (L\*) and red/green coordinates (a\*) showed no significant differences from treatments with respect control (69.912 and 1.072, respectively); however, 25 minutes was closer in both parameters (73.390 and 1.122) than 20 minutes (74.08 and 0.884). For the color difference, ( $\Delta E$ ), the 25 min value (3.84) was the most similar to the control. However, for tortilla thickness and diameter, the 20-minute with 1.57 mm and 13.12 cm respectively was closer to those of the control (1.69 mm and 13.86 cm) although smaller to it. On the other hand, the 25 min treatment tortilla was smaller than both 20 min and control with 1.51 mm thickness and 13.590 cm diameter. According to texture analyses, there was no difference in terms of stretchability (8.803-10.308 gf) and distance for the break (95.70-126.46 mm) among all treatments. However, for the breaking point, all treatments (317.1 gf and 276.5 gf for 25 and 20- min treatment, respectively) were significantly different from the control tortilla (392.2 gf). Results suggest that by adding a soaking step and reducing cooking time by 25 minutes, masa and tortillas obtained had similar functional and textural properties to the traditional nixtamalization process.

**Keywords :** tortilla, nixtamalization, corn, lime cooking, RVA, colorimetry, texture, masa rheology

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