



# Effect of hot water thermal treatments in the quality of minimally processed cactus stems cv. 'Atlixco'



Lizette Liliana Rodríguez-Verástegui<sup>1a\*</sup>, Clara Pelayo-Zaldívar<sup>1a</sup>, Fernando Díaz de León Sánchez<sup>1b</sup>, Guadalupe Judith Márquez-Guzmán<sup>2</sup>.

<sup>1</sup>Universidad Autónoma Metropolitana Unidad Iztapalapa, Depto. Biotecnología<sup>a</sup>, Depto. Ciencias de la Salud<sup>b</sup>

San Rafael Atlixco No. 186, Col. Vicentina, Iztapalapa, 09340, México.

<sup>2</sup>Universidad Nacional Autónoma de México, Laboratorio de Desarrollo en Plantas

Av. Universidad N° 3000, Col. Universidad Nacional Autónoma de México, C.U., Coyoacán, 04510, México.

lizette.liliana@gmail.com

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**Introduction.** Minimal processing of the nopal or cactus stem – a procedure that involves the removal of spines with a knife by lightly grazing both cladode surfaces and cutting around the stem's edges – triggers browning reactions in damaged areas, affecting quality and restricting commercialization in both domestic and international markets<sup>1,2</sup>. The aim of this study was to evaluate the effect of hot water thermal treatments in reducing the browning of refrigerated, minimally processed cactus stems of the variety Atlixco<sup>3</sup>.

**Methods.** Cladodes were harvested according to the official quality standard CODEX STAN 185-1993, disinfected in a chlorine solution at 200 ppm for 3 min<sup>4</sup>, and randomized before being subjected to hydrothermic treatment. In order to determine the most appropriate conditions for the latter, two experiments were performed: In the first, five temperatures were evaluated (38, 46, 50, 56 and 62 °C<sup>5</sup>) using a constant immersion time for each sample (30s) while in the second, six immersion times were evaluated (30, 60, 90, 120, 150 and 180s<sup>3,5</sup>) at the temperature that failed to produce thermal damage in the previous experiment. Each experiment included a control sample and each treatment consisted of three repetitions of 4 cladode stems each. All cladodes were placed inside polyurethane "clamshell" containers and were stored at 4 °C ± 1 °C with an 85% relative humidity.

**Results.** The conditions evaluated in the heat treatments showed no effect on either weight loss or in the pitting index (cold damage), but did so in the titratable acidity (TA) and in the browning index (BI). AT was reduced during storage from 0.8 to 0.5%, but the hydrothermic treatment that was best able to preserve it (0.7%) for 21 days was 50 °C for 30 s.

The BI on the other hand, was higher in controls and was altogether absent in the 50 °C to 56 °C treatments or at immersion times above 30s. Immersion times had a significant effect on both firmness and damage thermal (DT), showing a reduction of firmness due to the hidrotermia and with the DT being particularly severe in thermally-treated cladodes immersed for 120 to 180s. The color parameter *a* \* differed significantly between thermally-treated cladodes at 62 °C and the other treatments.

**Conclusions.** The conditions chosen for the application of heat treatment were 50 °C – 56 °C for 30s – 45s.

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